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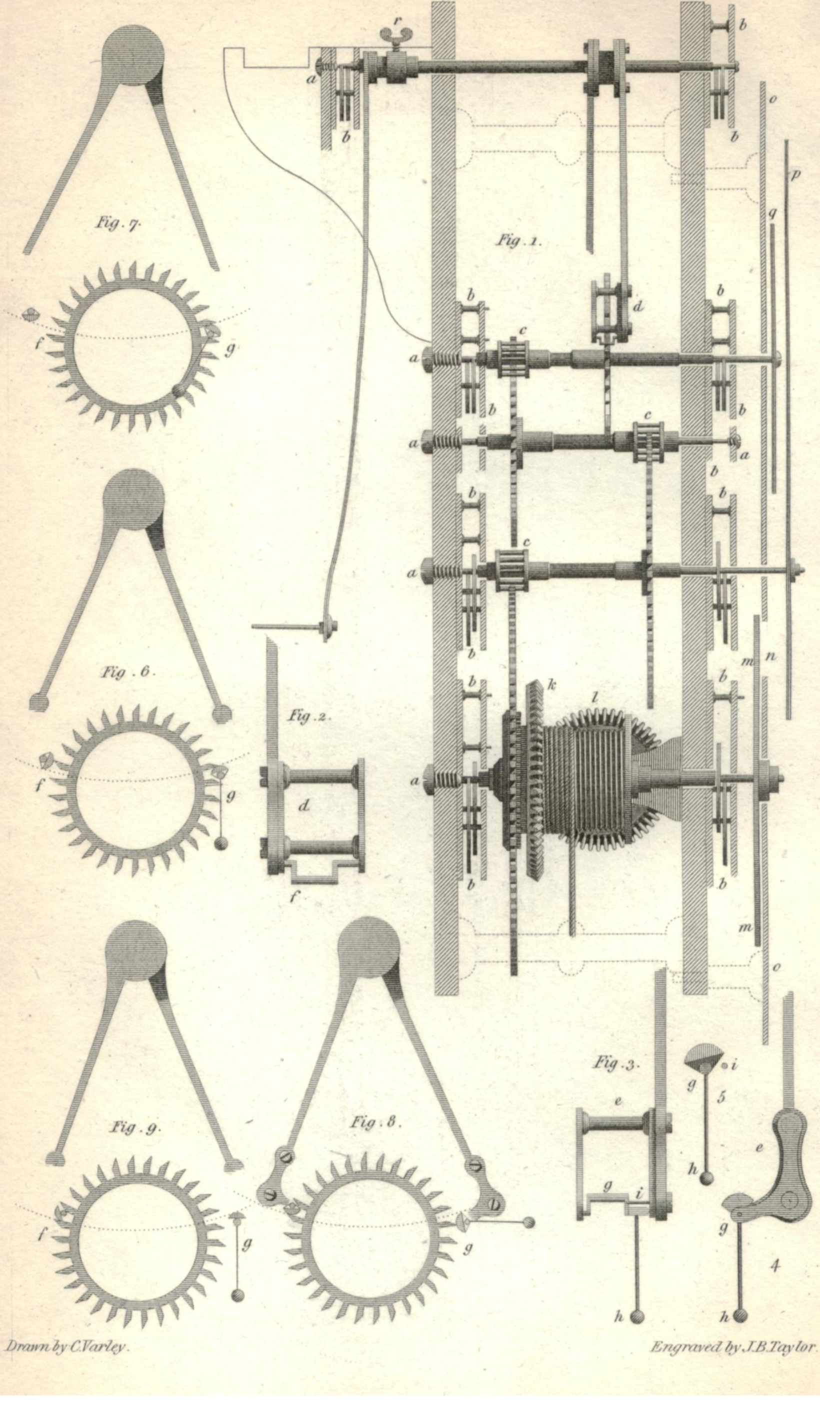
Mr. Wm. Wynns, Time-keeper.

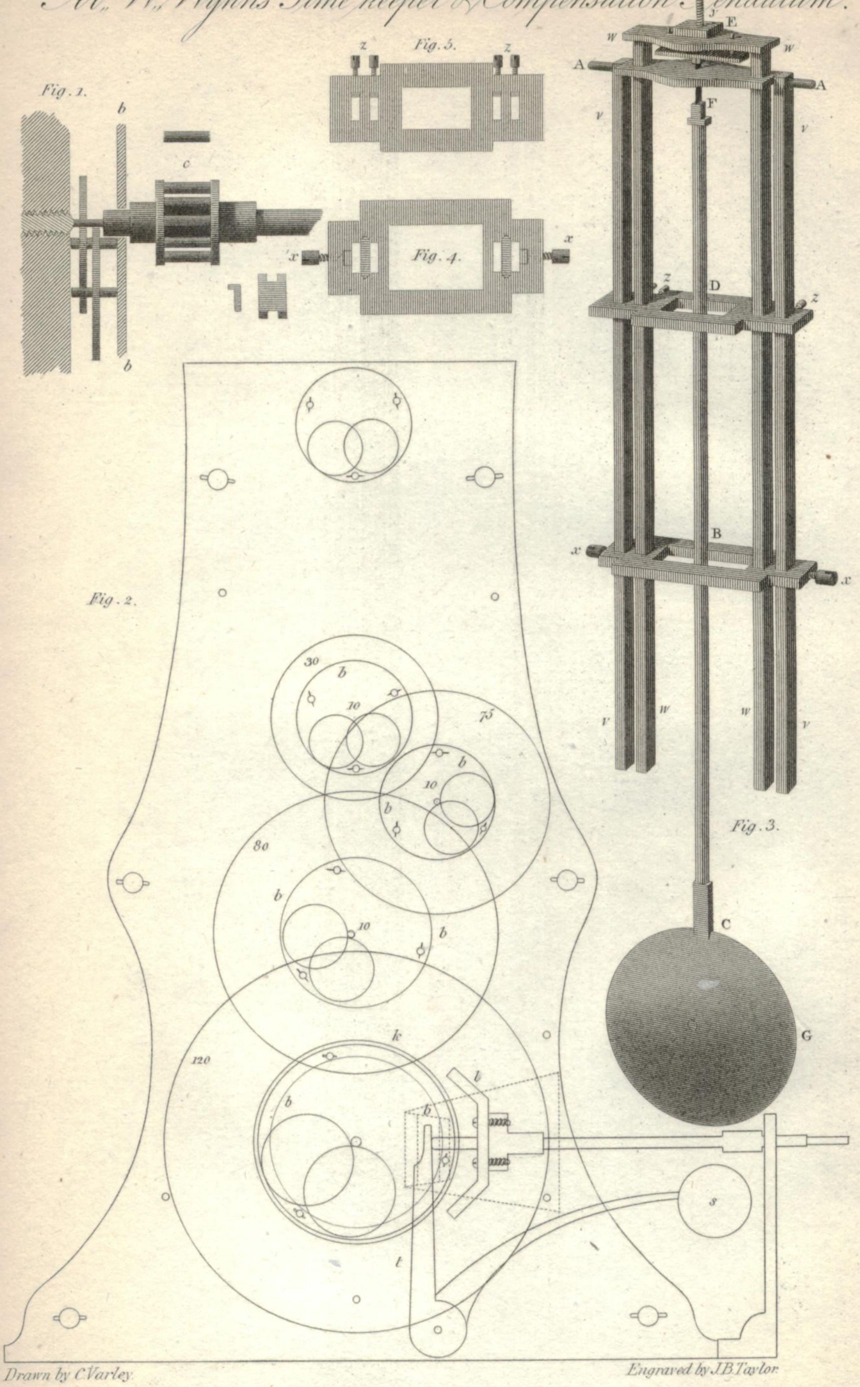
Pl. 8.



Drawn by C. Varley.

Engraved by J.B. Taylor.

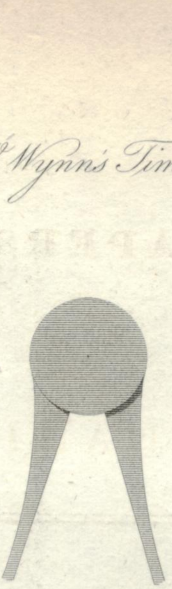
# Mr Wm Wynn's Time keeper & Compensation Pendulum.

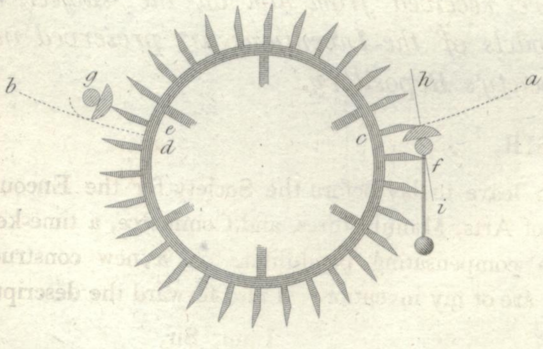


Drawn by C.Varley. Engraved by J.B.Taylor.

Pl.10.

Mr. W. Wynn's Timekeeper.





Engraved by J.B. Taylor

# PAPERS

# IN

# MECHANICS.

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*The* Gold Isis Medal, *and* Twenty Guineas, *were this Session voted to Mr.* William Wynn, *of Farnham, for a Time-keeper and Compensating Pendulum. The following Communications were received from him on the subject, and Models of the Inventions are preserved in the Society's Repository.*

SIR,

I beg leave to lay before the Society for the Encouragement of Arts, Manufactures, and Commerce, a time-keeper, and a compensating pendulum, on a new construction. They are of my invention. I also forward the description.

I am, Sir,
Your most obedient Servant,
WILLIAM WYNN.

*Farnham, May* 5, 1817.
To A. Aikin, Esq. Sec.

*Description*

### *Description of and Observations on the Time-keeper.*

It has ever been my opinion, from the experience I have had, that friction is one of the greatest enemies that clock-makers have to contend with in the construction of a perfect time-keeper; because it is a resistance which continually increases as the movement becomes foul, and varies as the oil is more or less liquid by the change of temperature of the atmosphere. I have, therefore, for some years, been endeavouring to form a plan to reduce it, and I flatter myself I can demonstrate by the one I have the honour to exhibit a very material diminution of friction in every part where it is to be met with in time-keepers of a common construction, and in some of the parts have entirely done away with it.

I have made the pinions to consist of cylinders which run freely round on small pivots, of one-fifth of their diameters, between two brass collets. When the tooth of the wheel comes in contact with each of those cylinders, it will run round on its pivot instead of suffering the tooth of the wheel to rub round a part of its circumference, or, as in common pinions, round the pinion-leaf. This will cause a diminution of friction in proportion as the diameter of the cylinder is to its pivot, and four-fifths of the friction will be lost.

I have placed friction-wheels in contact with all the pivots in the frame, which will reduce the rubbing friction of them as the diameters of the rollers to the diameters of their pivots, which cannot be less than twenty-five or thirty to one. The application of friction-wheels to pivots in many machines is by no means new; but I think it is new as applied to clock-movements.

The pallets are constructed of two segments of cylinders, which come in contact with the teeth of the swing-wheel, and go round on very small pivots immediately as the teeth strike each of them; and therefore they suffer the pendulum to vibrate after it has received its impulse with the smallest possible and most equal resistance; as the proportion of friction with these pallets, compared with the common dead scapement, is as the diameters of the cylinders, provided they were whole, to the diameters of their pivots, which is not less than twenty to one. When the pallet returns to give the impulse for the next oscillation, it still acts upon the rolling cylinder, slides along the curved inclined plane, and causes an equality of impulse, which must contribute to preserve a more equal arc of vibration than any time-keeper I have seen or heard described.

Besides the advantages gained by these diminutions of friction, I shall be able to make the movement go without oiling any of those parts which are usually oiled; as it will be necessary to oil only the pivots of the friction-wheels and cylinders, and not any of those parts in contact which are usually oiled; for as all the parts in contact will have a rolling and not a rubbing friction, (I know no better way to express the difference), there will be no necessity to oil them.

The parts which will require oil will be so very remote, in point of influence, that its maintaining power, and the resistance of the friction of the scapement, will be always equal in all variations of temperature and foulness. The pendulum must therefore oscillate at all times in an equal arc of vibration, which will prevent the necessity of using any artificial means to preserve the isochronism of unequal arcs.

I intend entirely to dispense with the wheels called motion wheels, which give motion to the hands. As three of the wheels of the movement revolve in the times which are necessary to give motion to the hour, minute, and seconds hands, they may as well be fixed to their several axes, as to be under the necessity of loading the movement with three extra wheels and a pinion for that purpose. The wheels which are destined to carry the minute and seconds' hands, will naturally have their motion in a forward direction, as there is a wheel in the movement between the two; but the wheel for the hour hand, viz. the great wheel, has a retrograde motion, which difficulty is obviated by having the hour figures engraved on a small circular plate instead of the dial, and fixing this plate on the axis of the great wheel instead of a hand. A hole is cut through the dial plate to let the hour figures appear through, and an index fixed to the dial to point to the figures. By adopting this plan the hour figures will not be retrograde, and consequently there will be no difficulty for the most ignorant to understand the hour the same as on a common clock. The only objection which can be made to leaving out the motion wheels is, that when the piece is to be set, each of the three hands must be set to the hour, minute and second of time; but that is a trifling objection compared to the advantage gained by the annihilation of friction and resistance which will be found in dispensing with them.

As the hour circle is fixed to the axis of the great wheel, the weight cannot be wound in the usual way through the dial plate. I have therefore cut the barrel-cap as a wheel of the bevel gear, and placed another wheel of the same sort with its axis at right angles to the axis of the barrel, with its teeth to run in the barrel wheel; and by having its axis extended to the side of the case, wind it up on the right hand side of it. The wheel on which the winder will go on is run in a sort of frame, with a considerable end-shake, and a poised lever acts against the inner pivot to drive the teeth of the handle wheel from being in contact with the barrel cap wheel, and prevent it from loading the movement as it goes. When the person winds up the piece, he must force the handle wheel inwards, so as to take hold of the barrel cap wheel, and wind it up; and, as soon as he takes off the handle, the wheel will fall back out of the way, and will be unconnected with the movement.

As I consider the pulley to be the worst mechanical power which is applied to clock work, I have done without it entirely, and suspend the weight with a single cord. I have made the barrel of half the usual diameter, which gives the movement the same time to go without winding, as the usual size with a pulley. The barrel, consequently, is not above one-fourth or one-sixth the weight of common sized ones, which will be again an advantage in the construction of the piece; as I consider that all the parts which are in motion ought to be made as light as possible, so as to have sufficient strength for their purpose. And, as all those are required to be light, so the frame and all stationary parts are required to be very strong and firm, to prevent the weight and pendulum from making it bend or sink out of the perpendicular, as it is obvious that no movement can keep regular time if it is not very substantial.

Having projected the movement, I began to consider what sort of pendulum to make use of. I had objections to the gridiron one, because the compensating bars are such a load to the pendulum, and raise the centre of oscillation above the point which ought to be the true one, because they suffer so much resistance in passing through the air; which resistance is continually subject to change, from the alterations of the density of the atmosphere, particularly in our climate, and because of the very great difficulty, if not impossibility, of adjusting the length of the compensating rods in proportion to the expansion of the metals made use of. I have been able to obviate all these difficulties, as I have contrived one which has nothing whatever in motion but the ball and one rod, and affords the means of altering the proportionate lengths of the compensating rods with the greatest minuteness at any time, without altering in the least the length of the centre of oscillation; and, with requisite attention, it can be adjusted with the greatest accuracy. The construction of it is as follows:—

A, plate 9, fig. 3, is a horizontal bar of brass, which is suspended on the movement: *v v*, are two steel rods, which are suspended on each end of A. B, is a horizontal bar of brass, with a square hole on the centre, sufficiently large to suffer the moveable rod, C, to swing freely between. On each side of the large square hole there is one smaller square one to fit one of the steel bars, *v v*, together with a zinc one, *w w*, of the same size, and a small piece of loose brass to keep the steel and zinc bars apart. On each side of the horizontal bar, B, is a screw, *x*, which screws against the side of the steel bar *v*, and fixes both the steel and zinc rods tightly in their holes. D, is another horizontal bar, which has also a square hole for the pendulum rod to swing in, and two holes on each side, which the two pairs of steel and zinc rods fit and pass freely through: *z z*, are two screws, which screw against the pair of steel rods to keep the bar, D, in its place, and also to keep both the pairs of rods always parallel. In the horizontal bar, A, is a square hole, at each end of which the pair of zinc rods pass freely through, and at about an inch above the bar, A, is another horizontal bar, E, in which are firmly rivetted both ends of the zinc bars. In the centre of the bar, E, is a hole, through which passes a piece of steel which is square at the bottom, and has a screw about half an inch long cut in the top, on which goes a nut to support the moveable rod, C. The pendulum spring, F, is rivetted into the square part at the bottom of the steel piece already mentioned. In the centre of the bar, A, is a slit to suffer the pendulum spring, F, to pass freely through ; at a small distance below the bar A, (about the length the pendulum spring is usually made,) the steel moveable rod, C, is to be rivetted to the spring, and the ball of lead G is suspended by its centre at the bottom of the rod C.

The compensating principle of this pendulum is the same as the gridiron one, with the advantage of having nothing but the centre rod C and ball G in motion, and it acts thus: Supposing the expansion of zinc to steel to be in whole numbers, as five to two ; if a change of temperature should occur, which would increase the length, 26 inches, of the steel rods *v v* two parts, the moveable rod C of 39 inches would be increased three parts, making an increase downwards of five parts. Then the same variation of temperature, in consequence of the above proportionate expansion of zinc and steel, would increase the length of the zinc rods of 26 inches in an upward direction five parts, and draw the pendulum spring F through the slit in the bar A, and shorten the centre of motion of the moveable rod, just in the same proportion as the steel rods *v v* and the moveable rod C were increased in length, and thus preserve the length of the centre of oscillation.

As the experiment to ascertain the expansion of metals is so delicate, it is very difficult to find the true proportionate lengths of the greater and less expanding rods, which are applied so as to preserve the length of the pendulum from change; and if the proper proportion is not found before the pendulum is made, it must be difficult and sometimes impossible to alter them. I have completely obviated this difficulty, and have the means of altering the proportion of the rods *v v* and *w w* in as minute or as great a degree as I please.

As I have before described, the zinc rods will always pass freely through the horizontal bar D, but if for instance I find by an increase of temperature that the pendulum should become shorter, or that the piece should gain, I shall then know that I have too great length of the upper expanding rod, namely zinc. I have therefore put two screws, which I shall screw in against the zinc rods, and as the two screws *z z* are always kept tight, the pendulum will then be held together by the centre bar D, and by that means the length of the rod C will be preserved. I shall then slacken the two screws *x x*, and raise the horizontal bar B upwards as much as I judge proper, tighten the screws *z z*, and slacken again the two that press against the zinc rods. When that is done, the proportionate length of the zinc is shortened, and consequently the upper expansion will not be so great.

To regulate the time-keeper, I alter the length of the moveable rod C by the nut which goes on the screw *y*, by which means I can at all times regulate it without stopping the pendulum, which is no small convenience; for, if you are under the necessity of stopping it, it is some time before it attains exactly the same arc of vibration as it naturally has, and consequently a trifling variation must take place in its rate before it does attain that.

I have placed a small loose plug for each of the ends of the screws to come in contact with, in order to prevent them from bruising the rods.

Another advantage which attends the pendulum described, is, that all the rods and bars may be made of as strong a substance as the workman pleases, as he need not be fearful of loading the pendulum in consequence of the compensating rods being at rest.

The workman is not prevented by this contrivance from making the pendulum spring pass between cycloidal cheeks, as they may be applied, if he think proper, to the horizontal bar, A.

I have made the model and drawing of the pendulum which accompanies this on a scale of three inches to the foot, and have adopted the combination of steel and zinc; but a pendulum may be formed of any combination of metals which may be preferred.

I hope the improvements I have made in the useful piece of mechanism which I have now the honour to lay before the Society for the Encouragement of Arts, may be found worthy their notice, and that I have given such a description of it as to convey a just idea of its principles: Should it meet with their approbation, I will make such a model of it as shall exhibit all its principles. If any further description shall be necessary, I shall be happy to give it either personally or by writing or drawing, in the best manner I am capable of.

### *Reference to the Engraving of Mr.* W. WYNN'S *Time-Keeper, and Compensation Pendulum.*

PLATE 8, fig. 1, a side elevation, the plates and friction-wheel frames being in section to show the pivots, which lie on friction rollers; the pivots are double, the larger one going through the same plate without touching it, and the smallest resting on the friction wheels: screws, *a a a a a a*, in the plates meet the pivot ends, and prevent their shoulders from touching the friction wheels or the frame plates, the shoulders are about $\frac{1}{200}$ of an inch from the wheels: the friction wheel frames, *b b*, *b b*, *b b*, *b b*, *b b*, *b b*, *b b*, are moveable on their centres opposite the pivots, by which they may be adjusted to receive the pivots on the side of friction.

*c c c*, Lantern pinions, the cylinders of which turn on small pivots; one of these pinions and a cylinder detached is shown full size at *c*, fig. 1, on plate 9.

*d e*, The pallet-frames; the pallets are segments of cylinders, shown full size in figs. 2, 3, 4, and 5.

*f*, and *g*, A small weight *h* hangs to the pallet *g* to keep it up in the best position to receive the teeth of the swing wheel; a pin at *i*, stops the pallet from vibrating at the instant that the weight *h* falls.

Figs. 6 and 7, show the wheel escaping the pallet *f*, and acting on the pallet, *g*.

Figs. 8 and 9, shew the escape from the pallet, *g*, and the action on the pallet, *f*.

*k* and *l*, fig. 1, Two bevel wheels to wind up the clock: *m m* the hour circle on the great wheel axis; *n* the hole in the dial to show the hours; *o o* the dial-plate, *p* the minute-hand, *g* the seconds hand; the friction wheels of the third wheel are left out to prevent confusion; *r* a screw to fix the crutch on the axis when the pendulum is adjusted.

Plate 9, fig. 2, the clock-plates, with the calipering of the train, showing the position of the friction-wheels in their frames *b b*; *k l* the bevel wind-up wheels; *s* a weight, which by the arm *t* disengages the teeth of the wheel *l* from the wheel *k* after it is wound up, its arbor sliding in the pivot holes; the dotted line represents the cock which supports the front pivot.

Fig. 3, a compensation pendulum frame, by which the compensation and adjustment is at top detached entirely from the pendulum; *v v*, *v v* two steel rods suspended at top; *w w*, *w w*, two rods of zinc, or of any metal that will expand more than twice as much as steel; if the metal expand less than twice, the rods must be so much longer than the pendulum; that is, the pendulum rod and rod *v v* together must be as much longer than the metal *w w* as its expansion is greater than steel; *x x* two screws in a moveable frame to fasten the steel and zinc rods together at any place the compensation may require; lowering this frame increases, and raising it decreases the compensating power; the rods being fastened together at bottom, whenever the steel expands, the surplus expansion of the metal *w w* must be upwards, and that elevates the screw *y* (to which the pendulum hangs) as much above the point of oscillation as the pendulum rod has lengthened, by which the ball is always kept at the same distance below the point of oscillation.

The nut on the screw *y* serves for regulating the clock: a piece of brass on the square bottom of the screw, with two steady pins, hold the screw from turning with the nut: *z z*, four screws in another frame; they are to give steadiness to the rods by holding them together, but not tight enough to prevent their sliding by expansion.

Figs. 4 and 5, show the plates separately; the figure of the bit of brass which divides each pair in the bottom plate is shown detached.

The figures of the clock are half the real size, but figs. 2, 3, 4, and 5, plate 1, and fig. 1, plate 2, are full size.

Plate 10, shews the escapement (fig. 9, pl. 8) of the full size.

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## *The* SILVER ISIS MEDAL *and* TWENTY GUINEAS *were this Session voted to Mr.* J. PRIOR, *of Nessfield, near Skipton, for the Striking part of a Clock. The following Communications were received from him, and a Model of the Invention is preserved in the Society's Repository.*

DEAR SIR,

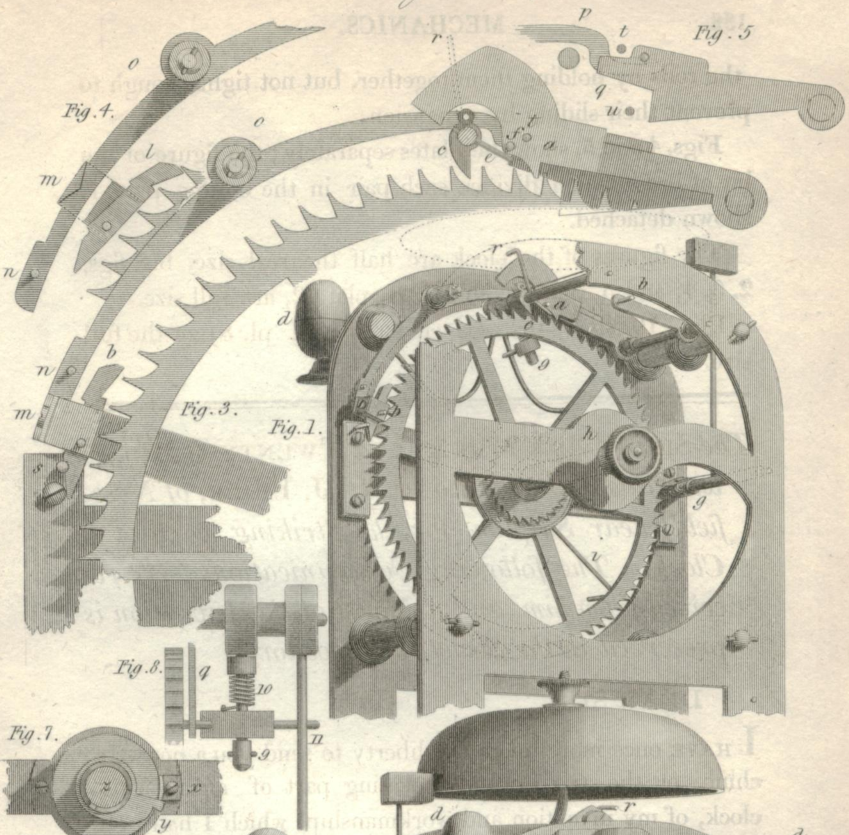
I HAVE once more taken the liberty to send you a new Machine, or the striking and repeating part of an eight-day clock, of my invention and workmanship, which I had nearly finished two years ago. You will much oblige me by laying it before the Society for the Encouragement of Arts, &c. the first opportunity.

This invention strikes the hours, and repeats them with only one wheel without fly, or pinion, rack, or step-wheel.

In repeating it has the advantage of not letting the spring or weight go down in any degree, but is just the same as if it had not repeated at all, which has never been done before that I know of in any clock which strikes every hour as the time passes.

The

# Mr. Prior's striking part of a Clock.



Drawn by C. Varley.

Engraved by S. Porter.

The centre of gravity of the two vibrating brass weights is below the centre of motion, otherwise it would not vibrate and keep time to unlock the detent that the hammer may strike the bell at proper intervals.

This horizontal vibrating motion, is a substitute for a train of wheels and pinions, the superiority of which may be known by asking this question: Whether will a train of wheels and pinions, or the striking part of a clock, take more power to turn the fly with the same velocity as when striking, having nothing to do with the hammers in either case.

The Committee will find this machine to stop when wound up by a method entirely new (at least it is so to me). I think it the best stop yet made for any machine which requires more than one turn.

When this has been examined as a striking part, please to take off the bell, and consider it as having no hammer or vibrating balls, or weights, &c. then it will be found to do for an Escapement for a Pendulum, which will give it one impulse every vibration.

I have the honour to be, Sir,

Your most obliged humble Servant,

JOHN PRIOR.

*Nessfield, near Skipton in Craven, Yorkshire.*

To C. Taylor, M. D. Sec.

## *Reference to the Engraving of Mr. John Prior's striking and repeating part of an eight-day Clock. Plate* 11.

Fig. 1. The clock with a corner of the plate taken away to show the escapement; when striking the regular hours, the detent *a* is unlocked by the pin *b* being raised, the tooth then falls

on the pallet *c*, which puts the vibrating balls *d d*, (see fig. 2) in motion, and they in returning, unlock the detent *a*, by means of the pin *e* which raises the detent pin *f*; and every tooth that passes strikes one by lifting the hammer pallet *g*; the spring that turns the count-wheel is in the box *h*.

Fig. 2. The other side of the clock, with the count-wheel stopt after striking four; to repeat the hour, the arm *i* is brought down, which raises the arm *k* carrying a click *b*, (seen best in figs. 1, 3 and 4.) at the back of this click is a bevel stud *m*, figs. 3 and 4, which in passing and re-passing depresses the pin *n* of the long stud-click *o*, this by its other end *p* raises the click *q*, (fig. 5.) and enables the fourth pin of the count-wheel to pass; the click *l* then brings back the count-wheel, till the third pin stops against the click *q*; the arm *i* is then brought up, which makes the click *l* repass the pin *n* and thus unlocks the detent *a*, and the hours are repeated, and thus asmuch of the spring is wound up as is required to repeat the hour; the detent *a* rises or falls without the click *q*; but the click *q* cannot rise without lifting the detent, by which the stud click *o* answers the double purpose, first, of liberating the count-wheel to go back one hour, and then of unlocking the detent to strike that hour: the click *q*, is only a repeating stop. R is a guard-hook to secure the detent down, while the tooth escapes the pallet *c*, the pallets *c* and *g* are moveable to let the count-wheel go back, and are kept in a right position by springs.

S, fig. 3, is a pin to keep the click *l* out of the teeth; the pin *t*, fig. 5, belongs to the detent *a*, and *u* is a count-pin.

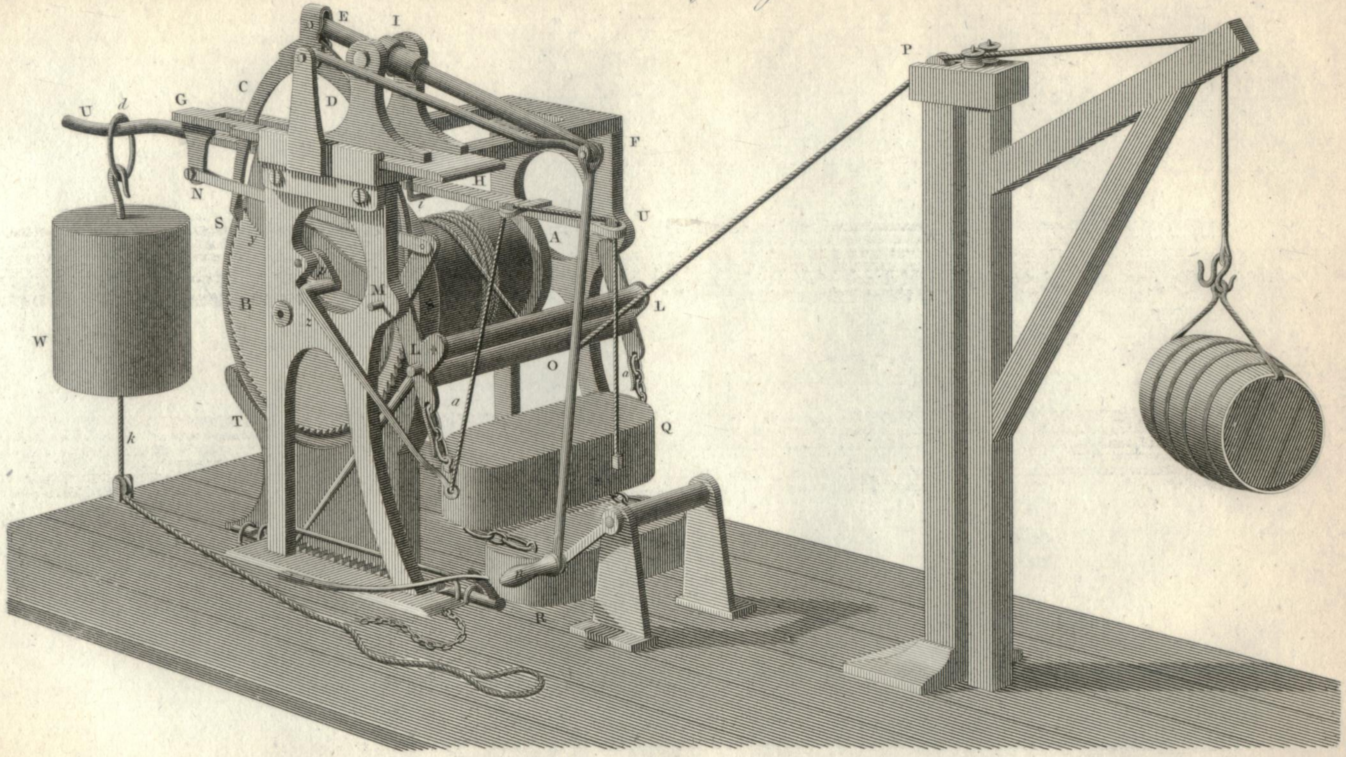
Fig. 6, a bird's-eye view of the movement: *w* the nut for winding up the spring, *h* the spring box, *x* a stop, *y* the moveable stop, which allows the spring to make one turn and three quarters between the stop *x* and the pin *z*.

Fig. 7, the spring box and stop.

Fig. 8,

Plate 12

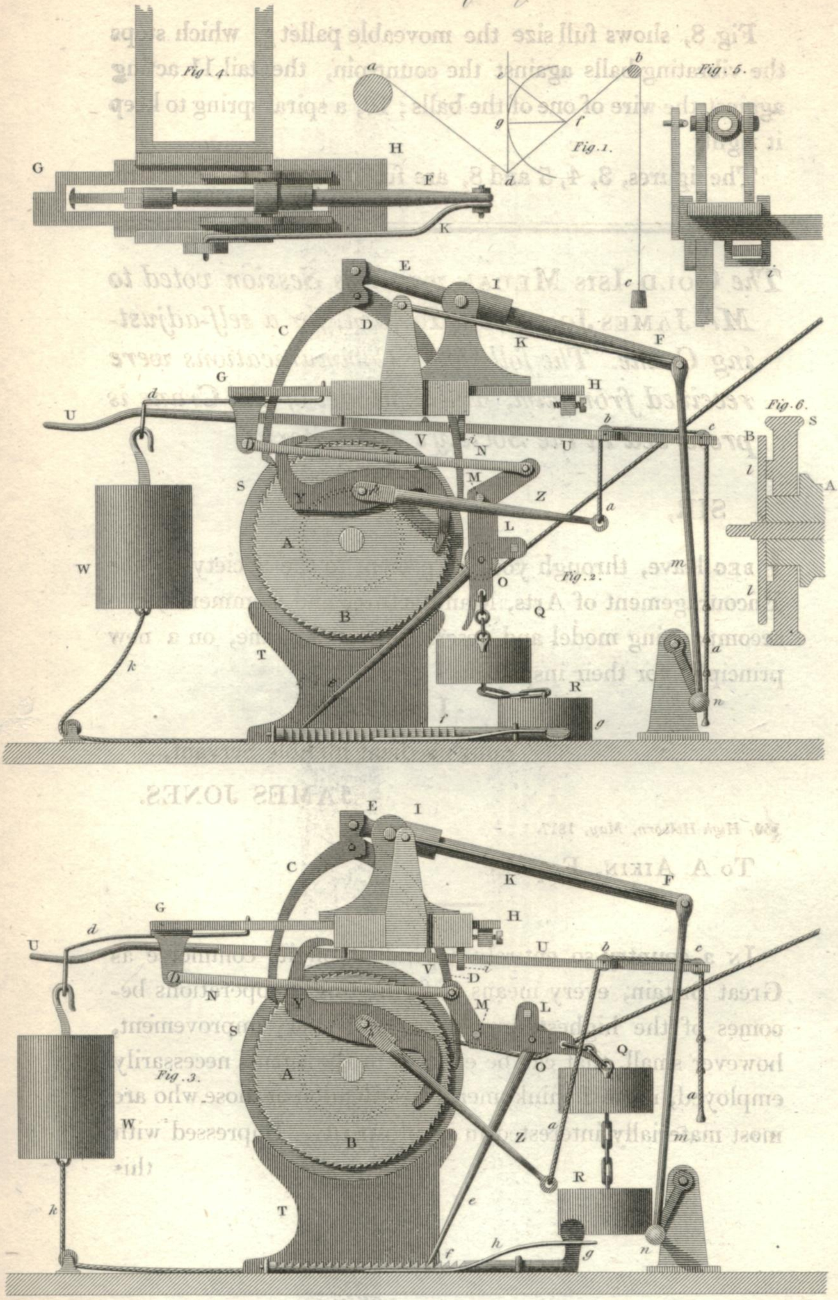
# Mr. James Jones's self-adjusting Crane.



Drawn by C. Varley.

Engraved by J. B. Taylor.

# Mr. James Jones's self-adjusting Crane.



Drawn by Cornelius Varley.

Engraved J.B.Taylor.

Fig. 8, shows full size the moveable pallet *g*, which stops the vibrating balls against the count-pin, the tail 11 acting against the wire of one of the balls; 10, a spiral spring to keep it right.

The figures, 3, 4, 5 and 8, are full size, 6 and 7, half size.

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*The* GOLD ISIS MEDAL *was this Session voted to Mr.* JAMES JONES, *of Holborn, for a self-adjusting Crane. The following Communications were received from him, and a Model of the Crane is preserved in the Society's Repository.*

SIR,

I BEG leave, through you, to present to the Society for the Encouragement of Arts, Manufactures and Commerce, the accompanying model and description of a crane, on a new principle, for their inspection.

I remain, Sir,
Your obedient humble Servant,
JAMES JONES.

150, *High Holborn, May*, 1817.

To A. AIKIN, Esq. Sec.

IN a country so entirely dependant on its commerce as Great Britain, every means of facilitating its operations becomes of the highest importance, and every improvement, however small, that can be effected in the agents necessarily employed, must, I think, merit the attention of those who are most materially interested in its prosperity. Impressed with this belief, and earnestly desirous of contributing my mite to the general stock of knowledge, I have lately directed my attention to a subject of some importance in the removal of goods, namely, *Crane-work*; and the result of my consideration I now respectfully submit to the Society for the Encouragement of Arts, Manufactures and Commerce, for their inspection.

The defect usually attributable to cranes is, that it is necessary to pass through as much space to raise a light load as a heavy one, unless an alteration be made in the relative velocities of the power and the load, by manually changing some wheel or pinion. To obviate this objection (which on public wharfs in particular, when almost every succeeding load varies in weight from the one last raised, is a very material one) was the purpose I had in view, and as I conceived that cranes possessing the property of spontaneous regulation would be a near approach to perfection, my attention was more particularly directed to that point, that is, to preserve at all times an equilibrium between the power and the weight, as nearly as possible, without much additional care or trouble to the labourer employed; and to effect this desirable purpose, I have endeavoured so to contrive the parts of a crane as that the attendant should scarcely be aware of the difference of the weights he is raising, but by the greater or less time required in the operation, the intensity of exertion remaining in all cases the same.

As the means by which I raise the load are different from those which are usually employed in cranes, that is, by the UNIVERSAL LEVER, it may not be improper (previous to detailing the manner of application) to describe it, as there are doubtless many persons unacquainted with the instrument so called. The UNIVERSAL LEVER consists of a large vertical ratchet-wheel attached to a barrel round which a rope winds drawing up the weight. Immediately over the wheel in the same vertical plane is fixed a lever of the first order, the end of the shorter arm being directly over the axis of the wheel; there are two rods of iron jointed to the end of the lever, one terminating in a broad flat point, and the other in a broad hook; if the longer arm of the lever is depressed, the hook attached to the short end having taken hold on a tooth on one edge of the wheel draws that side of the wheel upwards, whilst the broad point passes freely over the the teeth on the other side; but if the longer arm is raised, the contrary operation ensues; the hook looses its hold whilst the broad point, dropping into a tooth, thrusts that side downwards, and the hook proceeds down freely on its own side preparatory to taking a fresh hold. Thus, by continually working the lever up and down, its reciprocating motion is converted into a rotatory one in the wheel and barrel, thereby raising the weight attached to the rope.

Probably an objection may be here offered, that the motion of the load upward is always discontinuous, and effected by a succession of jumps occasioned by the regularly intermitted efforts of the two claws. To such objection (if it should be found to be a material one,) I would propose as an effectual remedy, the application of a fly-wheel.

Thus the application of the UNIVERSAL LEVER to the purpose of raising weights, not being new, so far I have no pretensions to originality; but a principle of self-adjustment, comprised in the variation of the proportionate lengths of the two arms of the lever, and that variation effected by the agency of the load to be raised, independent of the personal interference of the labourer employed, and such as I have here introduced, is, so far as my knowledge goes, entirely new.

The basis of my method of regulation is simply this; that if one end of a line is fixed, and the other end, having a weight attached, is passed over a pulley at some lateral distance, that part between the point of fixture and the pulley will, of course, form a right line; but if another weight is hung on between those points, the line will be drawn down more or less, according to the relative proportion of the two weights. Thus, let *a*, plate 12, fig. 1, represent the point of fixture, *b* the pulley, *c* the weight hung to the end of the line, and *d* the weight attached to the middle or any other part of the line, then draw *d e* perpendicular to the horizon, and *e f* parallel to *a d*, so will *e d* represent the weight fixed to the middle of the line, and *d f* the weight suspended from the end; thus it is evident, that as the weight *c* is increased or diminished, the weight *d* rises or falls, until the lines *e d* and *d f* bear the same proportion to each other as their respective weights. What those respective weights are, resulting from any given inclination of the lines with the horizon, may be determined with the greatest accuracy and facility by trigonometrical tables, or by the lines of secants and tangents, either on the plain or Gunter scales. Thus, nearly in the words of Gravesande, (Math. Elem. vol. I. page 96,) if the triangle *d e f*, a line *f g* be drawn parallel to the horizon, and that line be taken for the radius of a circle of which *f* is the centre, *d f* will be the secant, and *d g* the tangent of the angle which *d b* makes with the horizon, and *e f* will be the secant, and *e g* the tangent of the angle which *a d* makes with the horizon: whence it appears that the weight *d* is proportional to the sum of the aforesaid tangents, and the weight *e* proportioned to the secant of *d*.

Such is my principle. The manner of its application in the construction of a Crane (referring to the accompanying engravings, wherein the corresponding parts of each figure are designated by the same letters), is as follows.

Plate 12, is a perspective view of the Crane compleat.

Plate 13, fig. 1, is elucidatory of the first principle, as before detailed.

Figs. 2 and 3, sections without the frame-work, shewing the positions of the parts at different periods of their operation.

Fig. 4, a bird's-eye view of the slider, perforated fulcrum, and great lever.

Fig. 5, an end view of the slider and perforated fulcrum, and of the staple *i*, on which the brake-lever takes its bearing, when, by means of the relieving rope, it is raised off the brake-wheel.

Fig. 6, a section of the end of the chain-barrel, brake-wheel and toothed wheel, and shewing, by the two projections *b b*, the situation of the teeth on the outer face of the brake-wheel, and in which the clicks on the inner face of the toothed wheel take hold in lowering.

A, is the chain barrel, B the wheel on which the claws of the lever operate, C D the two claws jointed to the end of the great lever, E F G H is the slider sustaining the fulcrum of the lever, I the perforated fulcrum or socket, similar in shape to the middle part of a cannon cut off on each side of the trunnions, on which, as on two pivots, the lever performs its alternations, whilst the fulcrum occasionally slides along it. K is a rod jointed to the end of the lever at one end, and moving on a centre pin in a standard fixed to the frame work of the crane at the other, so as to prevent any longitudinal motion in the great lever; L is the regulator, being a frame hanging from the centres M, on which it turns upwards; N is a rod connecting the top arm of the regulator with the slider G H; O is a roller (contained in the frame of the regulator,) under which the crane rope or chain passes from the gibb (after having gone over the pully P) to the chain-barrel A; Q is a weight suspended from the regulator; R is another weight suspended at such distance below Q as to rest on the floor, and consequently does not come into action until the regulator and the other weight have attained a considerable elevation, sufficient to draw the intermediate suspending chain tight. These weights, it is evident, will, by the common action of gravity (unless prevented by some external means) retain the regulating frame in a vertical position, and the sliding fulcrum at its greatest distance from the wheel end of the lever, and consequently, when the lever is worked, produce motion in the wheel, amounting to a revolution at each alternation; but if the load is hung to the end of the rope, the endeavour of that load to form the rope into a right line gives the regulator a tendency to rise; and if the load is increased, thereby increasing the degree of tension, the regulator rises still higher, and by means of its top arm and connecting rod, slides the perforated fulcrum closer up to the head of the lever, which causes the wheel to move through a smaller arch of the circle, corresponding with the altered proportion of the length of the two arms of the lever, thus augmenting the effect of the power applied to the other end in nearly the same ratio as the addition to the load.

It will be readily seen that the manner of working the crane to raise a load, is either by the alternate elevation and depression of the lever by hand, as in working a common pump, or by the usual method of turning a winch *n*, which, by means of the rod *m*, communicates its motion to the great lever. It will also be seen (as I have before observed,) that the regulator rises in proportion to the intensity of the load, thereby adjusting the length of the lever, so as to produce a near approximation to an equilibrium between the power and the resistance; for if the load raised be multiplied by the number of teeth which the claws pass over at each alternation of the lever, the products will be found to be nearly the same for all loads within the power of the model.

Thus I conceive, that if the parts of the crane are perfectly proportioned with respect to the power intended to be employed in working it, the effect will in all cases approach very near the maximum.

It is to be particularly attended to in practice, that the angle *a d c*, fig. 1, plate 13, must at all times be more acute than the angle formed by the rope coming from the barrel to the roller O, and a line erected perpendicular on the roller must not contain so many degrees as the angle formed by that same perpendicular and the rope passing from the roller to the gibb, otherwise the regulator will not rise at all; for if the angles are equal, or if *a d c* is greater than *e d b*, the more intense the strain upon the crane-rope, the stronger will be the tendency of the regulator to retain its vertical position, or rather to turn backwards, thus depriving it of the governing influence it ought at all times to possess over the great lever; and I would suggest, by the way, that an index attached to the regulator would roughly indicate the weight of the load, and doubtless might be constructed so as to shew the weight with considerable accuracy.

The parts necessary to lower a load are these: On the end of the barrel is placed a large gripe or brake-wheel, T, which turns freely on the neck of the barrel in one direction, but is prevented from turning the contrary way by having ratchet teeth cut on its outer face, (as shown by the two projections *l l* in the section, fig. 6,) which being taken hold on by a click or clicks affixed to the inner face of the great wheel, B, obliges it to take the brake-wheel with it, when it attempts to turn backward. T is a segment of wood fixed firmly to the floor, and into which the brake-wheel S is forcibly pressed by the lever U U, which, taking its upward bearing by means of the protuberance V against the top of the frame work of the crane, the other end is held down upon the wheel by the action of the weight W, so that during the operation of raising a load, the brake wheel stands still, the neck of the barrel turning freely within it, and the click of the one passing without obstruction over the teeth of the other, it will be seen, that as the regulator rises or falls, the brake-weight W, is projected out farther from, or drawn in nearer to, the crown of the wheel, by means of the projecting rod *d*, which, connecting the weight with the sliding fulcrum, obliges them both to partake of the same motion, so that when the sliding fulcrum is in the most favourable situation for raising the load, the brake weight is also placed on that part of the lever proper to give the requisite degree of pressure to prevent the load from descending. It will also be noticed, that the end of the lever is bent obliquely downward, so as to form an inclined plane; the purpose to be effected by this bending is the assistance given by the brake-weight to the first rise of the regulator, when the load is but small. As it is evident that the chain-barrel cannot turn back to allow the load to descend, whilst the claws remain in contact with the teeth of the wheel, it becomes necessary, previous to lowering, to disengage them from their hold; to effect this, there is placed in the frame-work by the side of the wheel a plate of iron Y, of a peculiar form, called from its office the reliever, turning on a centre-pin *p*, and moved by the handle Z. To the end of this handle is attached a rope *a a*, which passes over two pulleys *b c*, in the end of the brake-lever, and hangs down by the side of the winch so as to be conveniently within reach. The operation of lowering is this; the winch being placed in its lowest situation, the labourer by pulling the relieving rope *a a* raises the handle of the reliever, which, by bringing the two opposite points which are most extended from its own centre-pin into contact with the ends of the two claws, detaches them from their hold on the wheel, as in fig. 2. The load would then descend by its own gravity; but the pressure of the weight W, which is always in action, being exerted to force the brake-wheel into the segment T, produces so great a degree of friction as will effectually prevent its descent, and the load consequently remains suspended, but a stronger pull on the relieving rope, (as the handle of the reliever cannot rise above a certain height) must necessarily depress that end of the lever, which changing its fulcrum by losing its bearing against the upper part of the frame at V, exerts less power on the crown of the wheel, and consequently allows the load to descend just as gently as the attendant pleases, and when it is necessary for the rope to be drawn out preparatory to raising a fresh load, a still stronger pull, by depressing that end of the lever so far as to take its bearing on the staple or cleat *i*, more plainly seen at fig. 5, raises the middle part of the lever entirely off the wheel, when a very small power is sufficient to draw the rope out as far as may be required.

The advantage I expect to obtain from the great weight on the brake is, that any load within the intended limits of the power of the crane will never be sufficient to overcome the resistance offered by the parts of the crane intended for that purpose, and consequently it never can descend but at the will and by the assistance of the person attending it, which, together with the security derived from the inherent property of the universal lever, of the efforts of the two claws on the opposite points of the periphery of the wheel always balancing each other, endues it with the valuable property of perfect safety.

After a load has been raised or lowered, and it becomes necessary to detach the ramshead or hook from the load, it would be found almost impossible to do so, in consequence of the regulator bearing with all its weight on the rope or chain, and thus keeping it at its previous degree of tension. To obviate this objection, I have made the following addition: *e* is a leg or prop loosely jointed to the regulator, which, as it rises, draws the end of the prop over the teeth of a rack, into which it takes firm hold when the regulator attempts to descend, thus affording it a sufficient support whilst the load is disengaged: *f* is the rack, being a cylindrical rod of iron having serrated teeth cut all along one side, and turning on pivots at the ends; attached to the rack is the treadle *g*, (supported by a spring *h*, as shown in fig. 3,) which being depressed by the foot of the labourer at the commencement of each lift, as shown in fig. 2, is made to perform part of a revolution, thereby presenting a plane side of the rack upwards, and consequently disengaging its teeth from their contact with the end of the prop, and thus allows the regulator to descend to its original situation.

As in some cases it might be desirable to employ more hands than the crane was originally constructed for, it would be necessary to prevent the rise of the regulator beyond a certain height by confining it down to its proper situation by a hook and chain affixed to the floor, that being a more simple method than the addition of more weight, as in this case, (supposing the load to be exceeding heavy) a greater degree of power would be required to be exerted on the brake when lowering. To effect this, I would attach to the brake-weight a rope *k*, and passing it under a pulley fixed to the floor, bring it to the labourer's hand, by which means he might give the requisite degree of pressure; and as it may happen at times that there may be many succeeding loads of nearly the same weight, it might be advisable, after the first lift has brought the regulator to its proper situation, to fix it there by means of the prop, and the hook and chain, thereby preventing the necessity of raising the regulator at each of the remaining lifts which may be of the same weight.

It may be proper to state, that I do not offer this model to be strictly copied for a crane of the full size, for I am quite aware that the arrangement of its constituent parts will admit of much improvement in the practical execution, and the necessary modifications would doubtless alter the form of it materially. It is only the principle I offer to the Society's consideration; and the approbation of a new principle, such as I think I am justified in stating this to be, is seldom found to possess so great a degree of perfection as practice renders it susceptible of; for this reason I trust I shall meet with the Society's indulgence for whatever imperfections of construction it may be found to labour under.

In conclusion, I have only to repeat that the Universal Lever, being an old and well known contrivance, so far as that alone is concerned, I can have no claim; but the principle of spontaneous adjustment, whereby the load, in all cases, is raised with the least possible expenditure of power and time, and that with absolute safety to the persons employed, will, I trust, prove to be perfectly original; what degree of merit it possesses remains for the Society to determine, and I beg leave to add, that should it be found deserving the Society's approbation, that circumstance will be to me the highest gratification.

J. JONES.

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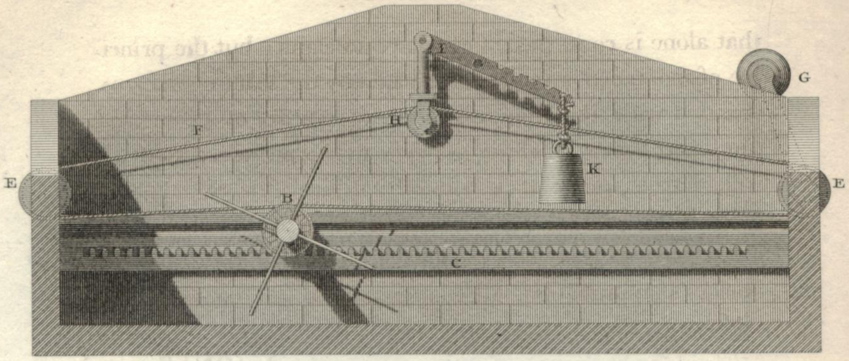
*The* SILVER MEDAL *was this Session voted to Mr.* R. W. BARCHARD, *of Waddon near Croydon, for a cylindrical traversing Rake, for the purpose of stirring Tobacco, Malt, Corn, Hops, Mustard, or any kind of seed, &c. The following Communications were received from him, and a Model of the machine is preserved in the Repository of the Society.*

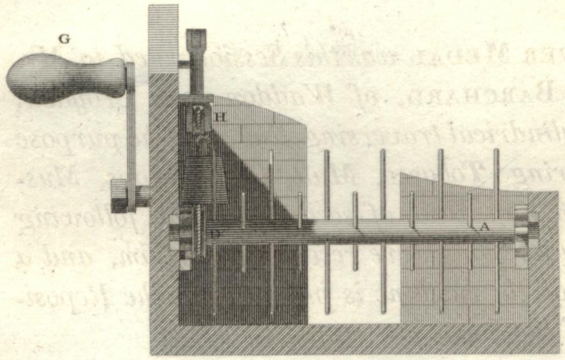
SIR

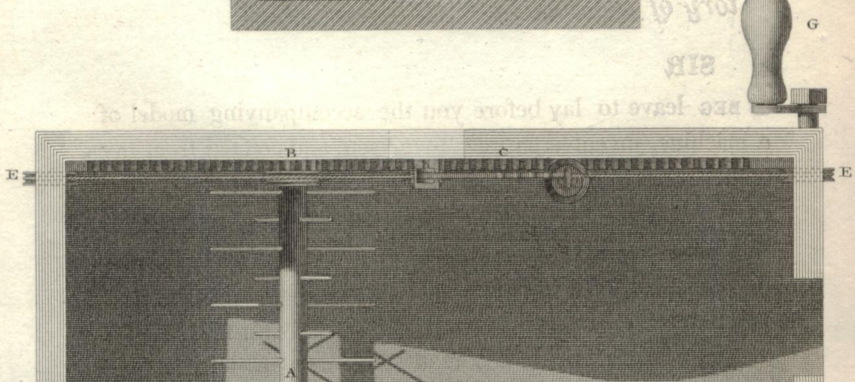
I BEG leave to lay before you the accompanying model of a machine, invented entirely by myself, and erected from my model by Mr. Webb, at his snuff mills at Beddington, Surry, for stirring together tobacco when drying on the kiln, the fumes arising from which are so powerful, as to render it hardly possible for a man to go in, until he has thoroughly ventilated the kiln, by drawing up the windows, &c.

The above model is not made to any particular scale, as the

# Mr. W. Barchards Cylindrical Rake. Pl. 14.







M.A.Nicholson Delin. Engraved by Jas. Davis.

the proportions must depend on the place in which it is erected, and the articles intended to be moved by it. I think I need not enter into any farther description, than merely to say, than on each side of the kiln there must be a rack and groove for the pinion and gudgeon to move in, with a pulley at each end to carry the rope or chain, and a small pulley in the middle with a weight suspended, to keep the rope tight enough to turn the rake, the teeth of which must be adapted to the goods it is intended to move. Should the door of the kiln be most convenient at the side, as it is at Beddington, the rack and groove are made to turn back on a hinge, thus leaving the door-way clear for the workmen to carry in fresh goods, or to take out those already dried. The handle also may, by a small bevel wheel, be brought to the end or side, which ever is found most convenient.

I remain, Sir,
Your's respectfully,
R. W. BARCHARD.

*Waddon near Croydon, March 1, 1816.*
TO C. TAYLOR, M. D. SEC.

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### CERTIFICATES.

SIR,

A machine for stirring tobacco was erected atBeddington mills, about two years since, of Mr. Barchard's construction, which has been found to answer the purpose.

I am
Your obedient Servant,
WM. PRIOR.

*Beddington, November 29, 1816.*
TO C. TAYLOR, M.D. SEC.

The accompanying is a perfect model of the rake, &c. invented by Mr. Robert Barchard, and erected at the snuff-mills at Beddington, for the purpose of stirring the tobacco when drying, preparatory to its being ground for snuff. It has been erected two years, and I have no doubt of its answering.
**WILLIAM PRIOR.**

*Snuff Manufacturer, Beddington Mills.*

## *Reference to the Engraving of Mr. Barchard's Traversing Rake. Plate* 14.

Fig. 1, is a longitudinal section of the apparatus.

Fig. 2, is a transverse section.

Fig. 3, is a plan of the apparatus.

A, the rake, being a cylindrical wooden bar, in which are inserted long and short staves alternately, for the purpose of stirring the tobacco, &c. at different depths.

B B, toothed wheels at the extremities of the rake, which work in the racks C C, that are laid on each side of the kiln.

D, a pulley on one end of the rake, round which the rope makes a single turn.

E E, two wheels at the end of the kiln, over which the rope passes.

F, the endless rope, by which the motion of the handle C, is communicated to the rake.

H, the tightning pulley, suspended at one end by the lever I, at the other end of which is the weight K, in order to keep the rope in a state of perfect tension.

Fig 5.

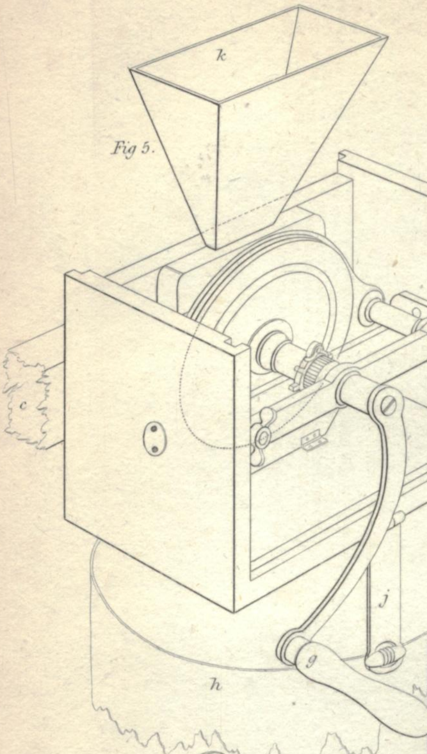


Fig 3.

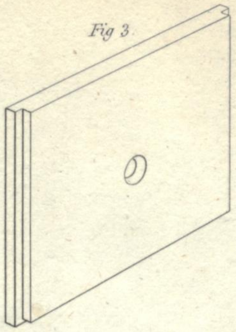


Fig 4.

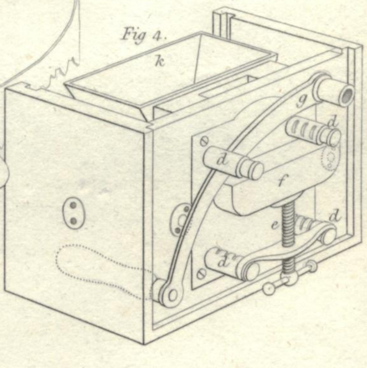


Fig 2.

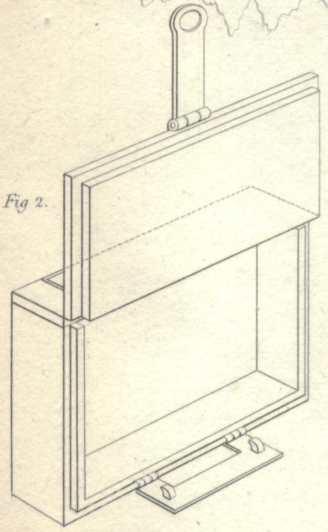
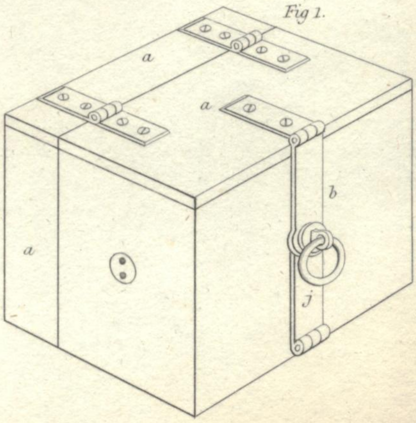


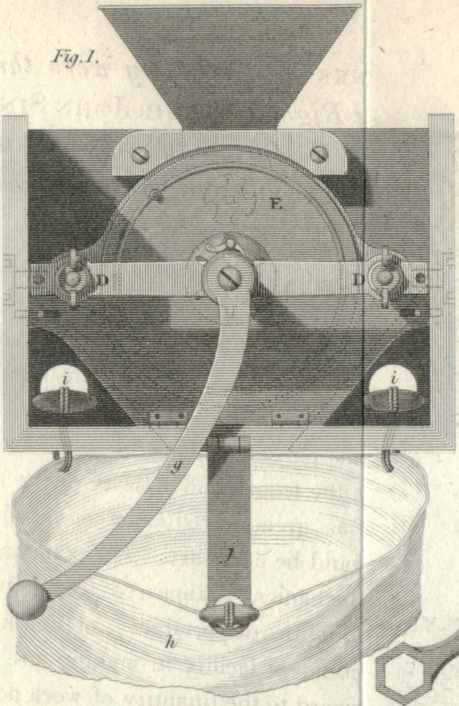
Fig 1.

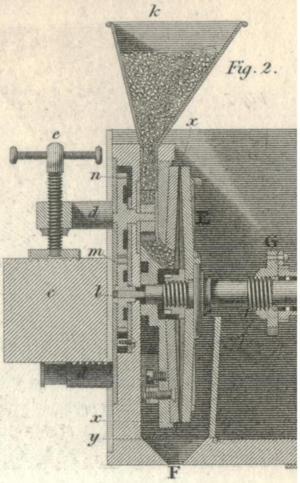


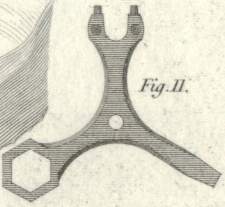
J. Clement del^t.

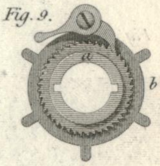
J. Davis sculp^t.

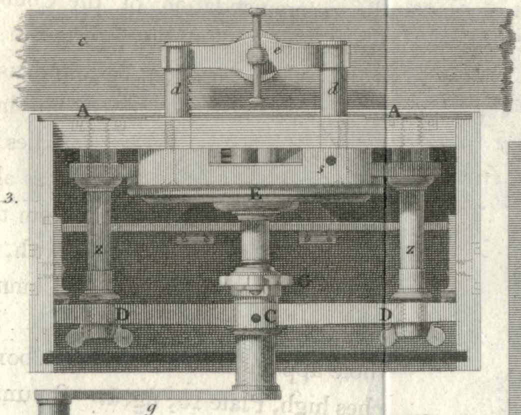
French Portable Military

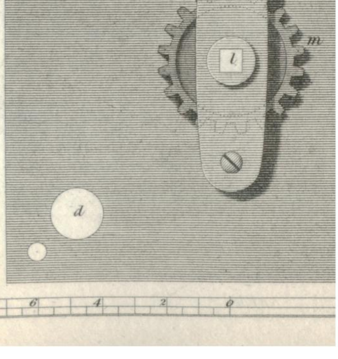


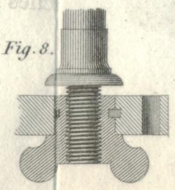


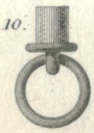












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Drawn by J. Clement.

Fig. 2.

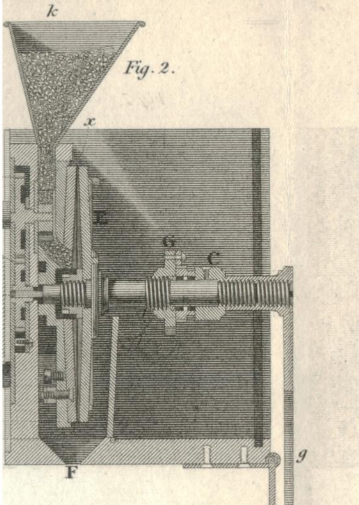


Fig. 7.

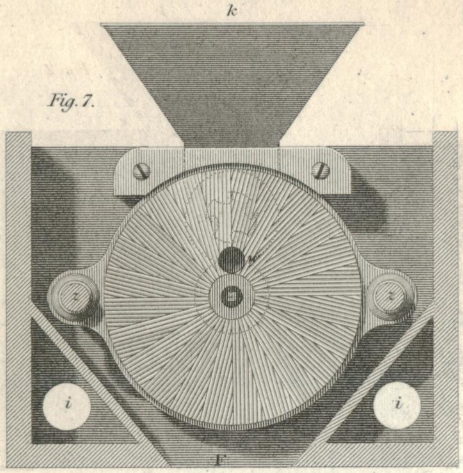


Fig. 9.

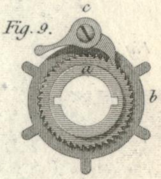


Fig. 5.

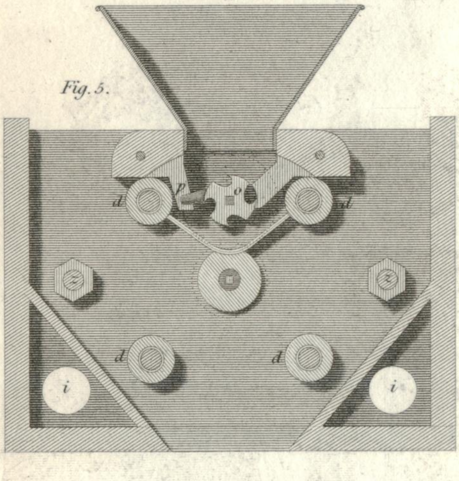


Fig. 4.

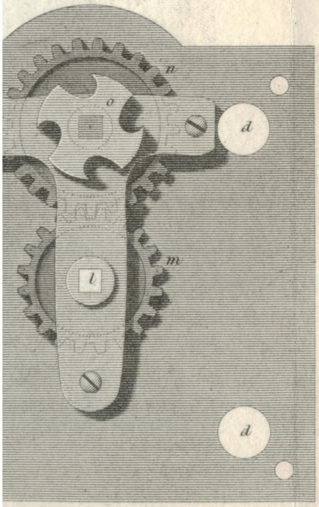
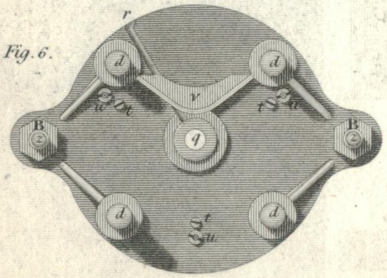


Fig. 6.



2 0 1 Foot

Engraved by James Davis.

## *The* THANKS *of the Society were this Session voted to the Right Hon.* SIR JOHN SINCLAIR, *Bart, for his Present of a* MILL FOR GRINDING FLOUR. *The following annexed particulars have been drawn out by the Secretary, and the Mill is preserved in the Society's Repository.*

THE French portable military mill, presented to the Society, by the Right Hon. Sir J. Sinclair, is one of many thousands which were used by the French armies in foreign service, and particularly in the Russian campaign, in which, from the length and rapidity of the march, it was manifest that as great a reduction as possible of the heavy baggage would be necessary. On examination by the Committee of Mechanics, it appeared to combine in an eminent degree the qualities of portability, of simplicity and ingenuity of construction, of facility in making use of it, and of expedition in regard to the quantity of work done. The Society, adopting the recommendation of the Committee, resolved that a description of it should be inserted in their annual volume, in the hopes that it might be found useful, not only in an army on active or foreign service, but in workhouses, in prisons, in schools, and in private families. An ingenious mechanic, a member of the Society, has already manufactured a considerable number, which, from the ready sale and general approbation that they meet with, appear fully to justify the opinion entertained by the Committee, of the utility of the machine as a family mill.

The whole apparatus is contained in a box 14 inches square and 8 inches high, Plate 15, fig. 1. On unscrewing the ring, and removing the portions, fig. 2, (*a a a*, fig. 1,) and fig. 3, (*b*, fig. 1,) the mill is seen packed up, fig. 4. In order to fit it for use, the mill is to be fastened to a strong table, a cross-bar, a tree, a gun-carriage, or any other proper support which may happen to be at hand,(*c*, fig.5, Pl. 15, and fig. 2, Pl. 16,) by means of the four iron pins, *d d d d*, fig. 4. Pl. 15, the screw-bolt *e*, and if necessary, by the wooden block *f*; the winch *g*, fig. 5, Pl.15, is to be screwed on to the axle; the sack *h*, fig. 1, Pl, 16, is to be hung below the mill by means of three buttons which pass through the holes *i i* of the frame, and the hole at the extremity of the flat bar *j*; the hopper *k*, is to be fixed in the slit which communicates with the feeder.

The grain being put into the hopper, the mill is brought into action by turning the winch *g*, which is attached to the common axle of the machine from which all the other parts receive their motion. The farther extremity *l*, Pl. 16, figs. 2, 4, of the axle is square; and fits into a corresponding hole occupying the center of the toothed wheel *m*, which latter turns another *n*. On the axis of this last is fixed the feeder *o*, consisting of an iron wheel between two and three inches in diameter; the circumference of which has four notches or cells, for the purpose of receiving the corn and conveying it in due proportion to the grinding plates. The wheel *m* has 20 cogs, and the wheel *n* has 25, therefore 5 revolutions of the common axle occasion four revolutions of the wheel *n*, and of course convey the amount of 16 cells full of corn to the grinding plates: fig. 5, Pl. 6, exhibits a section of the hopper and the feeder, and shows a small brush *p*, which prevents the feeder from becoming choaked.

Fig. 6, Pl. 2, is a back view of an iron bracket, to the other side of which the fixed grinding plate is attached; *d d d d*, are the iron pins already described ; *q* is a round collar in the center, through which the common axle passes; and *r* is a tube by which it is supplied with oil, which is poured in at the hole *s*, fig. 3 ; *ttt* and *uuu* are screws which fix the grinding plate to the bracket, and at the same time adjust the former so as to make it truly vertical; *v* is a lip to prevent the grain, while passing to the grinding plates, from being forced behind them.

Fig. 7, is a section of the mill, passing between the two grinding plates and showing the fixed one in its proper position, (it is scored or channelled nearly in the same manner as common grinding stones,) *n* is a passage by which the grain passes from the feeder to the grinding plates, *x* and *y* fig. 2, show the bracket and fixed grinding plate in their relation to the other parts of the mill.

*z z*, Fig. 3, Two horizontal pillars which pass through the back of the wooden case in which the mill is contained, and are kept firm in their places by the screw nuts A A, they also pass though the hexagonal screw nuts B B, and thus keep the fixed grinding plate and its bracket firm in their places.

In front of the mill is a strong cross bar, which supports one end of the common axle in the collar C, figs. 2 and 3, and secures the ends of the horizontal pillars *z z* by the screw nuts D D, which are represented on a larger scale, fig. 8.

The running grinding plate E, figs. 1, 2, 3, is fixed on the common axle by means of two nuts. Both grinding plates are channelled on their surfaces, as represented, fig. 7, and being somewhat concave, (as shewn in the section, fig. 2,) the grain becomes continually more and more comminuted as it passes from the center to the circumference of the plates, whence it falls through the slit F, into the sack suspended beneath.

The distance between the two grinding plates is determined by the regulator G, represented on a larger scale, fig. 9. It consists of a collar *a*, which slides backwards and forwards on the common axle; but is prevented, by two projecting ribs working in two grooves, from having any concentric motion. That part of the surface of the collar adjacent to the screw nut *b*, is indented like a ratchet wheel, in order to receive the click *c*. Hence the mode of its section is obvious. In proportion as the nut is screwed, so as to make the collar press against the cross bar, the running plate is brought nearer to, and at length into actual contact with the fixed one, while the contrary takes place by screwing the regulator in the opposite direction.

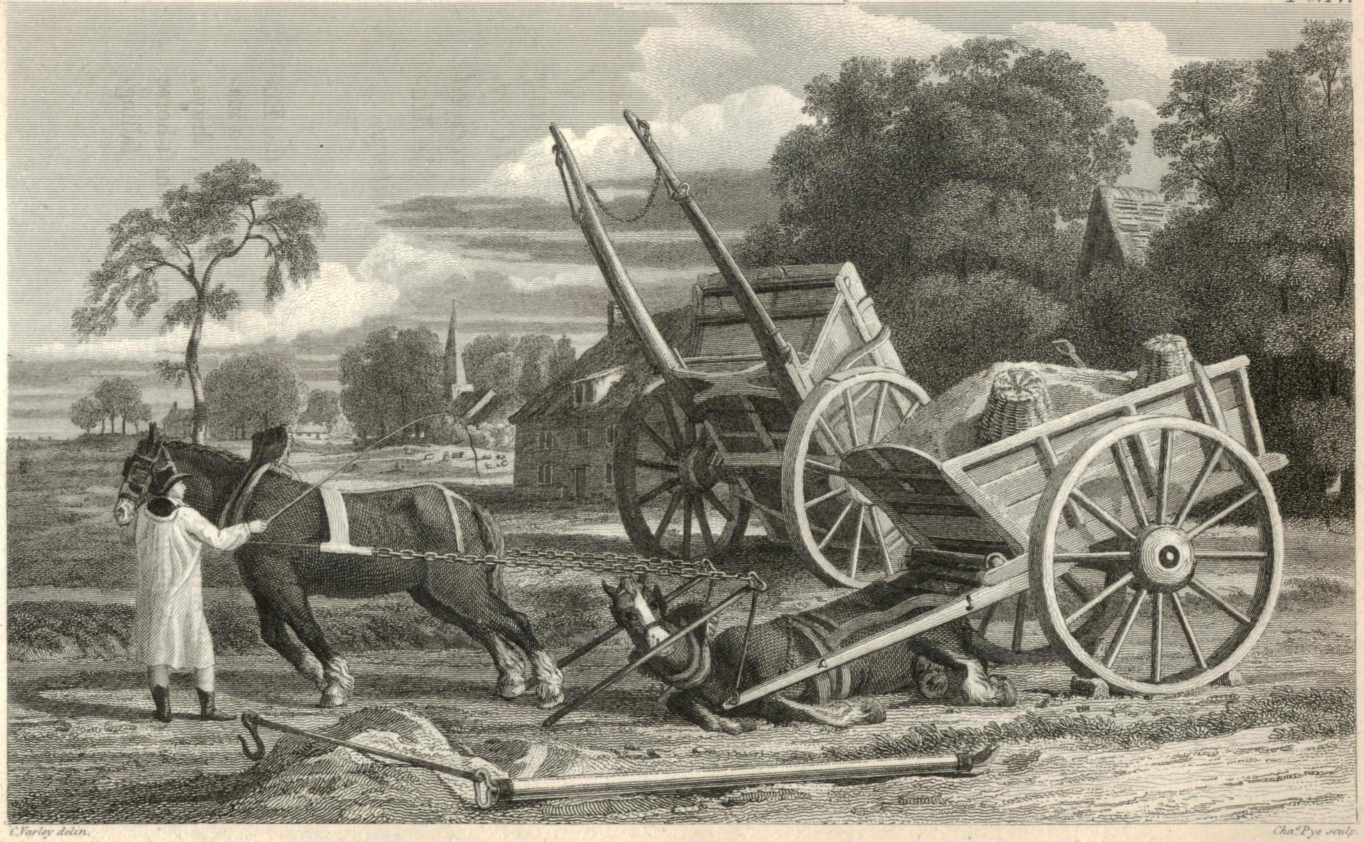
Fig. 10, shews the screw ring, which may be seen in its place, fig. 1, Pl. 15. Fig. 11, is the key for detaching the parts of the machine and putting them together again.

## *The* SILVER MEDAL *and* FIFTEEN GUINEAS *were this Session voted to Mr.* W. AUST, *of Gray's-Inn-road, for a Machine for freeing the Shaft Horse, when fallen with a loaded Cart. The following Communications were received from him on the subject, and a Model of the Machine is preserved in the Society's Repository.*

SIR,

I REQUEST that you will present to the Society for the Encouragement of Arts, Manufactures, and Commerce, a machine lately invented by me for raising loaded carts, drays, and any two-wheeled carriage, in the event of the shaft-horse falling.

Pl. 17.



C. Varley delin.

Chas. Pye sculp.

Mr. Aust's method of freeing the shaft-horse of a cart, when fallen.

falling. The first machine was tried at Messrs. Calverts and Co. Upper Thames-street, in the presence of Matthew Wood, Esq. Lord Mayor of London, John Foster, Esq. of the firm of Messrs. Calverts and Co., and several other Gentlemen, on Monday, the 30th of December, 1816: the above Gentlemen were fully satisfied, as the machine raised up a dray, with three butts of beer, in an instant. The Right Honourable the Lord Mayor gave an order for several of them to be placed about the different districts of the City for the accommodation of the public. The above machine is calculated to raise any two-wheeled carriage, in case of the shaft horse falling in any situation that it may, with ever so heavy a load. The machine is not very heavy, the weight 22lb. and is made conveniently to fix upon the shafts of the two-wheeled carriage, so that there is no difficulty in its being immediately applied by the drayman.

I am, Sir,
Your obedient Servant,
W. AUST.

*Gray's-Inn-road, February 5,* 1817.

To A. Aikin, Esq. Sec.

## *Reference to the Engraving of Mr.* W. Aust's *Machine for freeing the Shaft Horse when fallen, Plate* 17.

The instrument consists of the simple addition to the common props of the cart, of an iron bar and hook about half their length, attached to the top of each prop, and a bent iron prong at the bottom to prevent their slipping; the props are strengthened with an iron ferrule at each end; one of the props and hook-bar is shown on the foreground.

When a horse falls, the props are taken from their usual fastenings, and placed as in the engraving, with the hooks attached to the shaft ends; the fore-horse chains are then hooked in the loops at the top of the props, and as they stick in the ground when he pulls, he raises them perpendicular, and they pull the shafts up after them; the horse's power on the props increases as they become more upright, which is essential, as it gives the best help to the fallen horse when he is about to rise. On the second cart are shown the props slung to the shafts, the hooks remaining in the same rings of the shafts in which they would be put for action, and the props support the shafts on their own top as though the bars and hooks were not there, so that there is no inconvenience; the bars are not in the way, and their addition is not perceptible.

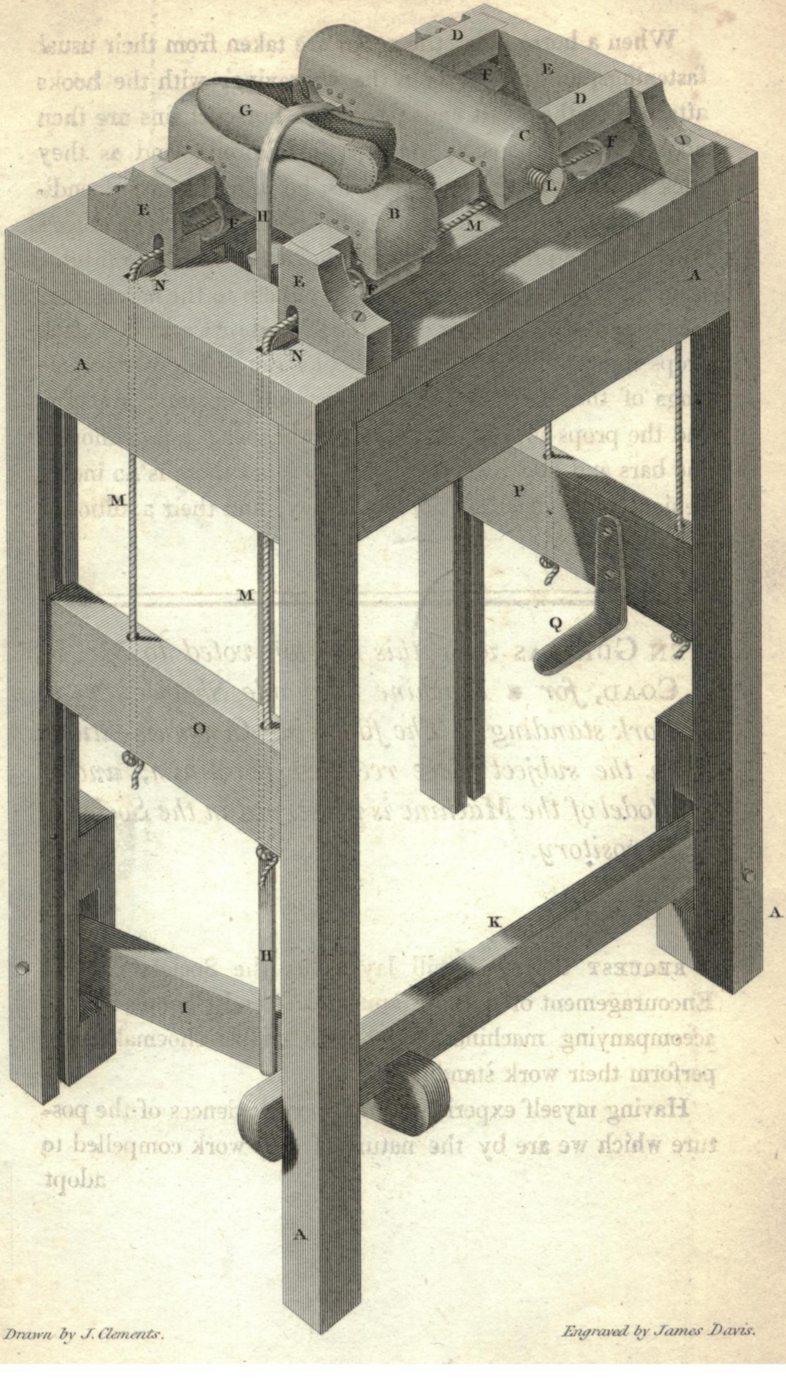
## TEN GUINEAS *were this Session voted to Mr.* F. COAD, *for a Machine to enable Shoemakers to work standing. The following Communications on the subject were received from him, and a Model of the Machine is preserved in the Society's Repository.*

SIR,

I REQUEST that you will lay before the Society for the Encouragement of Arts, Manufactures and Commerce, the accompanying machine intended to enable shoemakers to perform their work standing.

Having myself experienced the inconveniences of the posture which we are by the nature of our work compelled to adopt

# Mr. F. Coad's Shoe-making Machine. Pl. 18.



*Drawn by J. Clements.* *Engraved by James Davis.*

adopt if we sit to it, and being desirous of changing as little as possible the method of holding our work, which from long experience has been found to possess many advantages, I have constructed a machine, the leading principle of which is to imitate as far as possible by means of moveable blocks the support afforded by the knees and thighs in the ordinary way of working.

Having proved the efficacy of this machine by a fair trial of some months, I take the liberty of offering it to the patronage of the Society; and remain,

Sir,
Your obedient Servant,
FRANCIS COAD.

*No. 8, White Horse-yard, April 25, 1817.*

### *Reference to the Engraving of Mr.* F. Coad's *Machine to enable Shoemakers to work standing.*

The machine is shown in perspective, Plate 18. A A A A is a wooden frame or bench, two feet eight inches high, and two feet long; B C represent two artificial thighs or blocks, made of wood and covered with leather, which are supported by two rails D D; these rails are not fixed at the ends, but are at liberty to move up and down in the brackets EEE, under which are four rings F F F F, made of stiff leather, acting as springs to prevent any noise or shaking that may be made by beating the leather, &c.; G, a shoe and last held tight to the block B, by the foot-thong or strap H, which goes over the shoe and under the treadle I, and thus can be pressed down by placing the foot on the treadle K. The block B is fixed to the rails D D, but the block C is made to slide on the rails, or may be fixed by the screw L in any place required. To the under side of the block C are fixed two cords M M, passing through the leather springs and over the pulleys N N, and fixed to the block O; the other ends of the cords are conducted over the pulleys in a similar manner and fixed to the block P; those blocks are made to slide up and down guided by the grooves in the ends of the frame. To the inner side of these blocks are fixed brackets or treadles Q R. If the treadle Q be pressed down by the foot, it will pull the thigh or block C to the end of the rails, but if the treadle at R, which cannot be seen in this view, be pressed down, the block C will be pulled close to the block B, and thus the shoe may be held in any position required.

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*The* SILVER MEDAL *was this Session voted to Mr.* WILLIAM CASLON, *of Salisbury-square, Fleet-street, for an improved Gas-Lamp. The following Communication was received from him on the subject, and a Model of the Lamp is preserved in the Society's Repository.*

SIR,

I send herewith an improved gas lamp, which I will thank you to lay before the Society, and I trust it will meet with their approbation.

I am, Sir,
Your humble Servant,
WILLIAM CASLON.

*Salisbury Square, Fleet-street, March* 20, 1817.

To A. AIKIN, Esq. Sec.

*Reference*

Fig. 1.

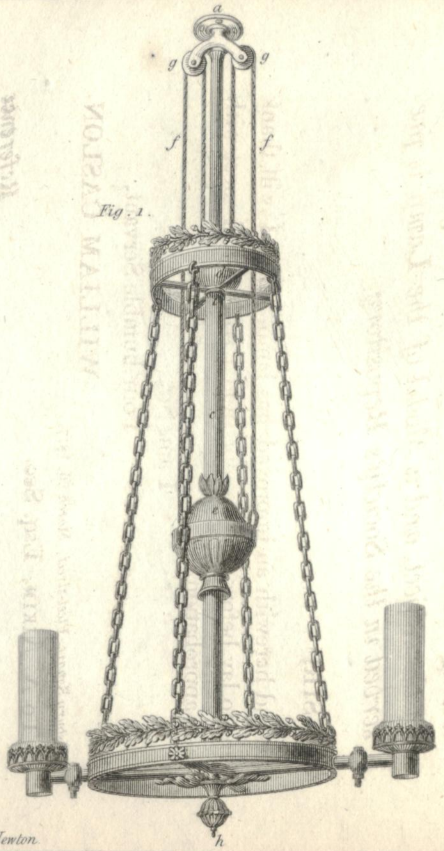


Fig. 3.

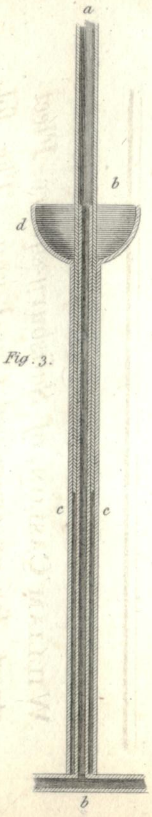
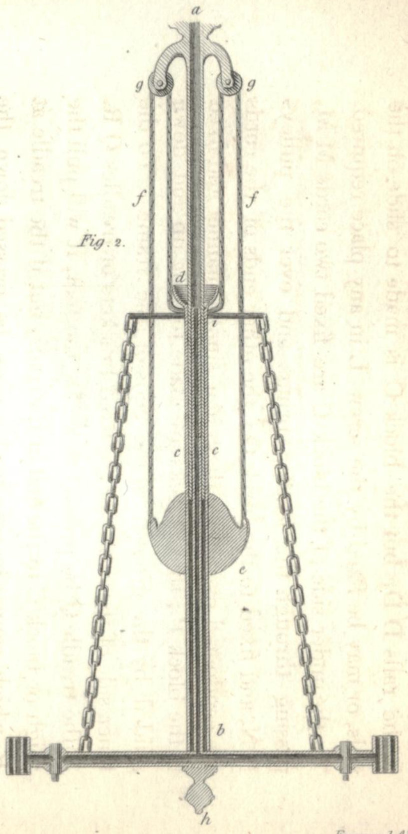


Fig. 2.



Drawn by W. Newton.

Engraved A.W. Warren.

M.R W. CASLON'S, GAS LAMP.

### *Reference to the Engraving of Mr.* W. CASLON'S *Gas Lamp.*

PLATE 19, fig. 1, a view of the lamp.

Fig. 2, a section of the same.

Fig. 3, a section on a larger scale of the gas pipe.

*a*, The middle pipe.

*b b*, The inner pipe, opening at its upper extremity into *a*, and at its lower extremity into the lateral pipe which supplies the two lamps.

*c c*, The exterior pipe, closed at the bottom, and expanding at the top into a cup *d*.

*e*, The balance-weight, supported by the cords *ff*, which pass over the pulleys *g g*.

In order to fit the lamp for use, take hold of the knob *h*, and push the lamp up as high as the balance-weight *e* will permit; then pour water into the cup *d*, till the exterior pipe *c* is quite full, and the water rises half way up the sides of the cup. Under these circumstances, it is obvious that the gas coming in by the pipe *a* will be prevented by the interposed water from escaping between the inner and middle pipes, and will pass through the pipe *b* into the lateral pipe which supplies the lamps.

The gas-pipe *c* passing loosely through the balance-weight *e* and the collar *i*, allows of a free rotatory motion in the lamp; and the water-joint produced by the three pipes allows the lamp to be raised or depressed nearly to the extent of the length of the pipe *c*.

*The* GOLD CERES MEDAL *was this Session voted to Mr.* C. ESSEX, *of East Acton, Middlesex, for a Machine for cleaning Corn. The following Communications were received from him, and a Model of the Machine is preserved in the Society's Repository.*

SIR,

I BEG you would be pleased to submit, for the inspection of the Society for the Encouragement of Arts, Manufactures and Commerce, a model of an improved machine for cleaning corn, of my invention. It is peculiarly adapted to use under a thrashing machine, as by one process, with the same power necessary for the thrashing machine, it compleatly cleans the corn and renders it fit for market; at the same time dividing the different substances into the several compartments, with the power (by altering the sieves) of making two sorts of corn (by cleaning both,) or, in other words, by taking away as much of the small corn or tailing, as may be required, thereby rendering a sample superior in quality.

Having used the machine nearly eighteen months, I beg to remark, that from its peculiar power of dividing the dust from the chaff, I find the latter much more nutritious for cattle; and the superior mode of clearing the rubbish, that the corn may fall to the wind alone, renders it much more susceptible of the quick succession of friction, which compleatly eradicates every particle of mould, and, in a degree, has the effect of drying and improving the sample; and which, as in the last wet season, renders it peculiarly useful;

ful; added to these, are many other advantages which will suggest themselves to those acquainted with the necessity of such convenience and expedition in agricultural pursuits.

In the hope that the machine will be honoured by the approbation of the Society, and be generally useful,

I have the honour to be,
Your most obedient humble Servant,

C. ESSEX.

*East Acton, Feb.* 17, 1817.

To. A. Aikin, Esq. Sec.

### Certificates.

Sir,

Having seen your newly-invented machine work, I with pleasure give it my entire approbation, and sincerely congratulate you on your success. It is far superior to any I have ever seen, inasmuch as it saves much trouble and expence in the necessary division of racquet, chaff dust, hulks and corn, which it divides in a very compleat manner, rendering the corn perfectly clean and fit for market. I think that the division of the dust and small seed weeds from the chaff a great improvement, as, when the chaff is carried into the stable, the carter generally sifts the seed weeds in the dung, which of course is carried again to the field.

I remain, Sir,
Your most obedient Servant,

Robert Bagshaw.

*East Acton, February* 17, 1817.

To C. Essex, Esq.

My Dear Sir,

I was much pleased the other day by the inspection of your machine, and I most sincerely congratulate you on your having brought it to such perfection. It certainly is by far the most compleat in every respect, and does its work in a much superior way to any I have ever seen.

I am, my Dear Sir,

Your's very truly,

William Delamain.

*Berners-street, February* 17, 1817.

Mr. C. Essex.

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Sir,

I have carefully examined the machine which you have invented for clearing corn, and I approve of it entirely for these reasons: First, it separates the chaff and rubbish from the corn at once, so that the latter is quite clean and fit for market immediately, which, for several reasons, must be of great advantage to the farmer. Secondly, the chaff is separated also from the dust, and therefore is better for cattle. Thirdly, the seeds of weeds being also, with the dust, thrown apart from the chaff, can be destroyed, so as not to go to the dunghill and be carried to the field again. Fourthly, the corn passing so rapidly through the several sieves must be much dried and cleared from mould;—a great benefit, in my opinion as a mealman, especially in seasons like the present. And, fifthly, to these advantages I may add, that *all* is effected by one and the same, and no greater power than that which at the same time puts the thrashing machine in motion.

I am, Sir,
Your obedient Servant,
J. ADAMS.

*Acton Mill, February* 18, 1817.
To Mr. C. ESSEX.

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DEAR SIR,

IN answer to your's of Tuesday last, requesting my opinion of your newly-invented cleaning machine, I have great pleasure in stating that, to my judgment, it fully answers the purposes intended, particularly that of cleaning the corn, and at the same time compleatly separating the chaff from the dust, which, of course, renders it in a much better state for cattle. I must at the same time observe, that I consider it a great acquisition attached to the thrashing machine, in compleating the whole of the business, which before was not more than half done, and that in great confusion.

I remain, Dear Sir,
Your's very truly,
C. FRISBY,

*Acton, February* 19, 1817.
To C. ESSEX, Esq.

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DEAR SIR,

I BEG leave to express my entire approbation of your newly-invented machine, which I saw at work the other day,

day. In my opinion it claims the superiority over every other machine I ever met with, by the facility with which it clears away the different substances, such as racquet, hulk, and chaff, and stops the dust: by these means the corn is presented to the wind in the same state as when it has passed twice through other machines, and is by one process cleaned and rendered fit for the market. It has also the power of making two samples, which, by altering the sieves both at the same time, and preventing the dust from being blown with the chaff, renders the latter more nutritious for horses; and the small seeds remaining with the dust, prevents them from being carried into the field again. I beg to remark, that by the quick succession of friction the grain undergoes, it not only rubs off any dust or mould, but dries it and renders the sample much brighter; besides, the advantages must be great, arising from the convenience, expedition, &c. by which every part of the process is attended.

I am, Dear Sir,
Your's truly,

Robert Tubbs,

*Harlesden Green, Wilsden, February* 19, 1817.

To Mr. C. Essex.

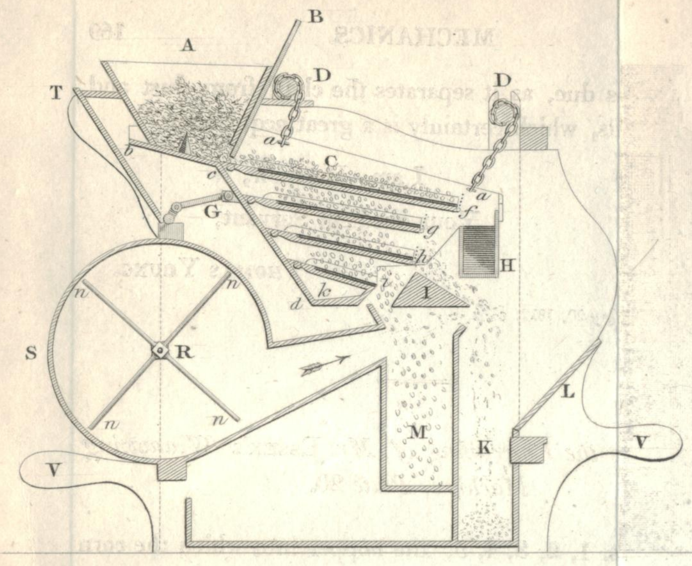
---

Dear Sir,

Having been present at the working of your improved cleaning machine, I have much pleasure in saying, that I am perfectly satisfied as to the compleat manner in which it delivers the corn at once clean and fit for market; also, that great

Mr. C. Essex's Winnon

Fig. 1.



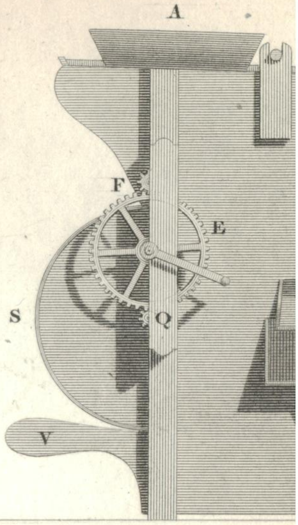


Fig. 6

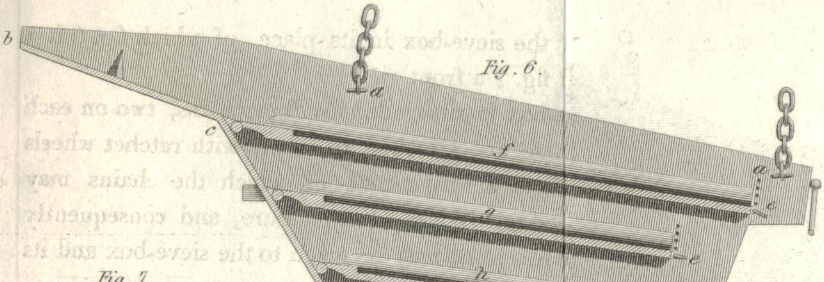


Fig. 7.

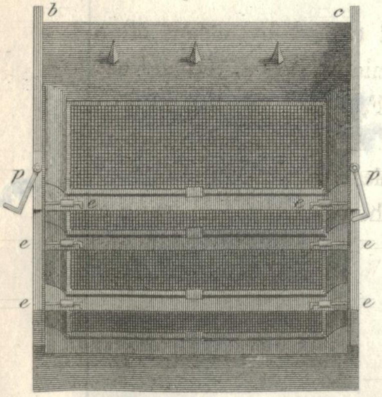
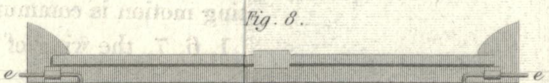
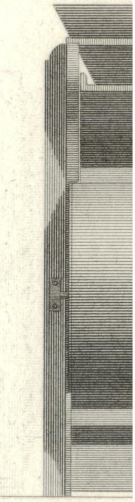


Fig. 8.





Drawn by W. Newton.

*ssex's Winnowing Machine.*

*Fig. 2.*

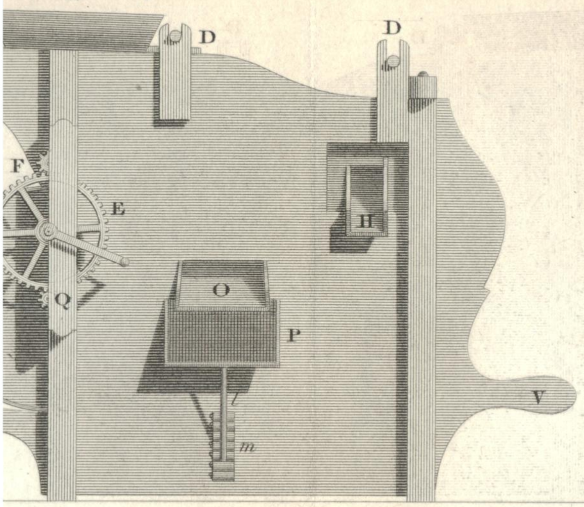


*Fig. 4.*

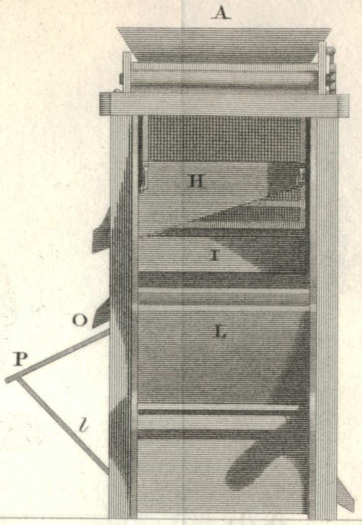


*Fig. 5.*

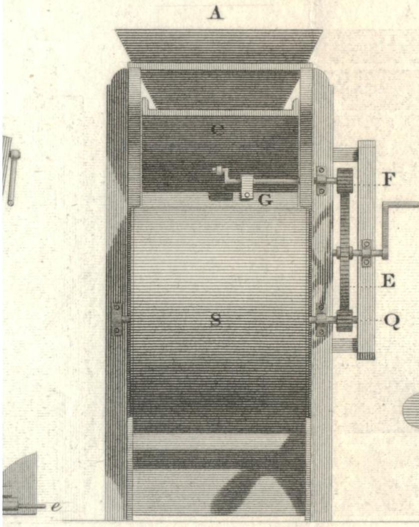
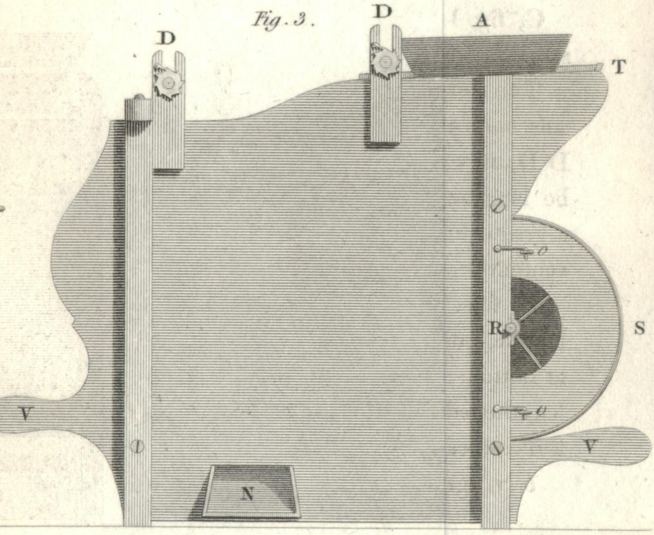


*Fig. 3.*



*Engraved by S. Porter.*

great merit is due, as it separates the chaff from dust and seeds of weeds, which certainly is a great acquisition.

I am, Dear Sir,
Your obedient Servant,

THOMAS YOUNG.

*East Acton, February* 20, 1817.

## *Reference to the Engraving of Mr.* ESSEX's *Winnowing Machine, Plate* 20.

A A, figs. 1, 2, 3, 4, 5, the hopper into which the corn is poured, as it comes from the thrashing mill.

B, fig. 1, a sliding board by which the size of the aperture, through which the contents of the hopper are discharged, is regulated.

C, fig 1, the sieve-box in its place, of which fig. 6 is a section, and fig. 7 a front view.

The sieve-box is suspended by four chains, two on each side *a a*; these are attached to rollers with ratchet wheels D D, figs. 1, 2, 3, by means of which the chains may be lengthened or shortened at pleasure, and consequently a greater or less slope may be given to the sieve-box and its contents.

E, figs. 2 and 5, a cog-wheel turned by means of a handle, and working into two pinions, one at top and one at bottom; of these, the former F, figs. 2, 5, has its axis lengthened into a crank G, figs. 1, 5, by means of which a reciprocating motion is communicated to the sieve-box.

*b c*, figs. 1, 6, 7, the wing of the sieve-box, consisting of a sloping a sloping board, which forms the bottom of the hopper, and into which are inserted three pegs, in order to prevent the racquet from collecting in the hopper.

*c d*, figs. 1, 6, the back of the sieve-box, to which are attached the hinges of the sieves.

*e e*, figs. 6, 7, bolts by which the sieves are supported in front, by being pushed into holes in the sides of the sieve-box; to each sieve are four or five pairs of holes, which thus admit of considerable variety in the degree of its slope. Fig. 8 shews the front of a sieve, with the bolts on a large scale.

*f*, figs. 1. 6, the upper sieve made of split willow wands, by which the racquet is separated from the corn and other substances. The corn, &c. falls through the meshes of the sieve, and the racquet sliding over the front is received in the wooden spout H, figs. 1, 2, 4, which conveys it out of the machine.

*g*, figs. 1, 6, the second sieve, of wire, which detains the chaff and hulks, and allows the dust, small weed-seeds, and corn to pass through; the hulks and chaff fall over the front of the sieve upon the inclined plane, I, figs. 1, 4, and thence into the receptacle K, fig. 1; and, as they are falling, are exposed to the blast from the fan, by which they are cleaned from the dust and thus rendered better food for horses: the contents of this receptacle are taken out by drawing the sliding board L, figs. 1, 4.

*h*, figs. 1, 6, a wire sieve (the 3d), the meshes of which are closer than the preceding, in order to detain such hulks as pass through the former. These fall over the front of this sieve upon the inclined plane just mentioned, and so into the receptacle K, fig. 1.

The lowest sieve *i*, fig. 1, 6, has it meshes so close, as only to allow the dust together with the weed-seeds and small corn to pass through; the full grown corn rolls along its surface, and falls over in front upon an inclined plane, by which the grains are dispersed and thus are exposed to the blast from the fan, which carries off the light impurities. The corn being now thoroughly cleaned, falls into the box M, fig. 1, where it remains free from dust.

The dust, &c. that passes through the lower sieve, falls into the receptacle *k*, fig. 1, 6, and is discharged from the machine by the spout O, fig. 2, 4; it then falls on the sieve or screen P, fig. 2, 4, which by means of the foot *l*, and the notches *m*, may be set to any required slope, and thus will separate the small corn from the dust and weed seeds.

The cog-wheel E, fig. 5, already described, turns the pinion Q, the axis of which prolonged, forms the spindle R, fig. 1, 3, to which the fliers *n n n n*, fig. 1, of the fan are attached.

S, fig. 1, 2, 3, 5, the cover or hood of the fan, fastened by hooks and staples *o o*, fig. 3, and therefore capable of being removed at pleasure.

T, fig. 1, 3, a sliding board, allowing access to the crank for the purpose of greasing or repairing it.

*p p*, fig. 7, hooks by which the racquet spout is suspended below the sieve *f*.

V V, figs. 1, 2, 3, handles of the machine.

*The* Silver Medal *was this Session voted to Mr.* Gabriel Bray, *of Charmouth, Dorsetshire, for a Life Boat. The following Communications were received from him, and a Model of the Boat is preserved in the Society's Repository.*

SIR,

I beg leave to send you herewith, for the inspection of the Society for the Encouragement of Arts, &c. a model of a Life Boat, which I have constructed.

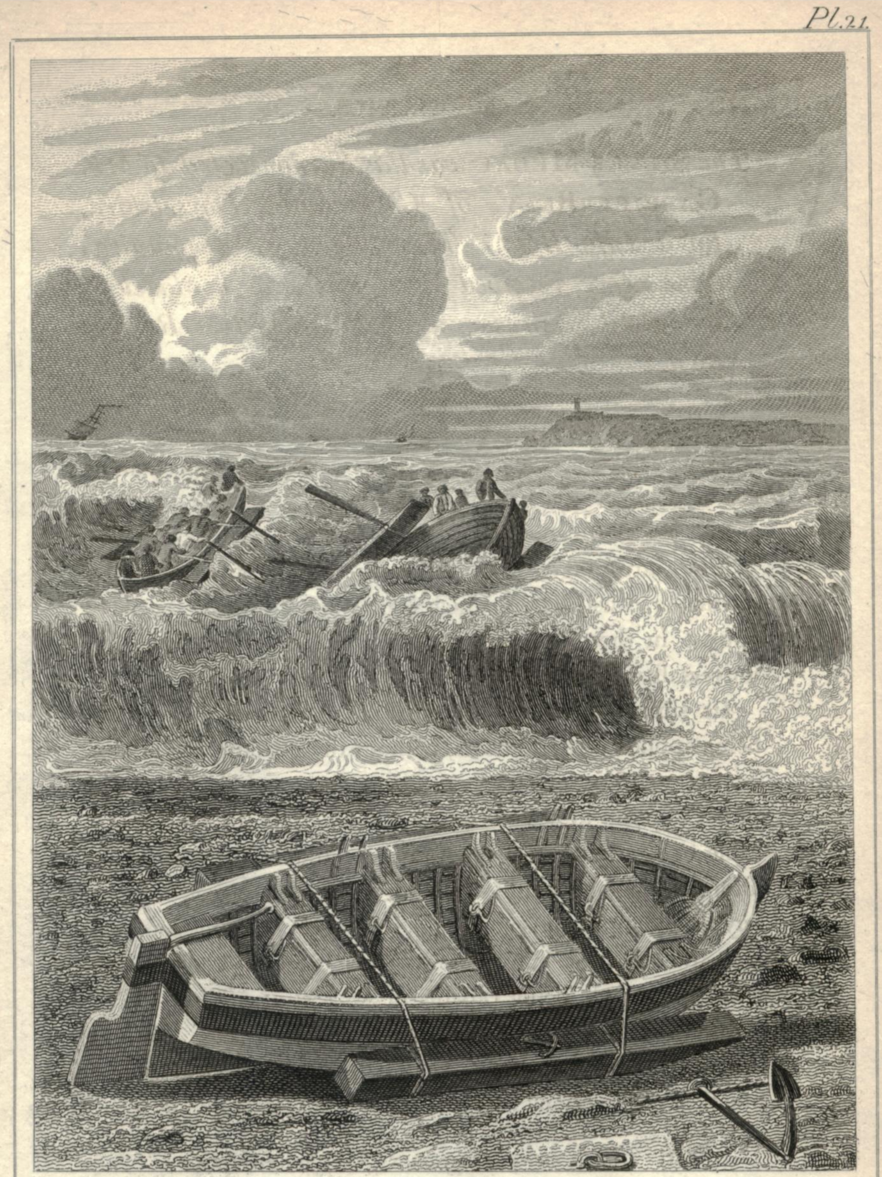
The advantages which I propose to obtain by the particular construction which I now submit to the Society, consist in the peculiar simplicity of the plan, and the universality of its application.

Its simplicity is conspicuous in the circumstance of its being applicable to all boats, without the introduction of any incumbrance or inconvenient fitting up, and its extensive utility appears to be sufficiently evident, from its being applicable to all boats of whatever form or dimensions; and by its affording the opportunity of bringing into operation, without any attendant inconvenience, a very great body of confined air, the superior buoyancy of which is well known, one cubic foot of air being capable of supporting 56lbs.

But as I conceive that the model will best shew the nature and quality of the invention, I shall only add a few practical observations respecting the mode of applying it.

1st. *As to measuring boats for the Air-boxes:*

Measure under the thwarts of the boat intended to be fitted with air-boxes, for the tops of the boxes, as at A A, in figure 1, Plate 21, then let fall a perpendicular line from the thwart,



Drawn by Cornelius Varley

Engraved by A.W.Warren.

Capt$^{n}$. Brays Life Boat.

thwart, observing where it touches the boat's bilge inside, as at B B; this will give the exact angle for each end of the box, for that thwart. Next measure horizontally across, for the length of the bottom of the box, as from B D, to B, allowing an inch spare in the top and bottom, that the box may be put in its place with ease.

### 2dly. *As to preparing the Air-boxes.*

For making and fitting the air-boxes, I would recommend clean deal plank, free from knots, or rents, of one inch thickness; great care should be taken in planing them, to make those parts that are to be nailed together very exact and true. Make a composition of one-eighth part rosin, and seven eighth parts of pitch, well mixed together by boiling, then, beginning with the bottom sides and ends, pay well with the hot composition all the parts that are to be nailed together, dipping every nail in the composition before it is driven. Pay also all the inside of the box well with the same composition, and likewise the upper edges of the sides and the ends, and then nail on the top, first dipping every nail in the composition. Let there be a small bung-hole in the top of the box, about the size of the mouth of a common bottle, for the purpose of affording an opportunity to ascertain, by blowing into the bung-hole, whether the box is completely air tight; and if not, where the defect is. The bung-hole, when the box is fitted in the boat, will be always close up under the thwarts, but still to prevent the starting of the bung, which might be attended with fatal consequences, I would recommend, that two pieces of sheet copper, of the shape described in figure 3, should be fixed on with short screws, the straight piece of copper to be fixed by a screw at one end only, to traverse under the semi-circular piece, which is fixed by screws at both ends, so as to cover the bung, and confine it down securely. For the better preservation of the air-boxes, they should be well painted outside, and to denote their proper place in the boat, they should be numbered 1, 2, 3, 4, &c. to shew the thwarts to which they belong.

3rdly. *As to fixing the Air-boxes in the Thwarts.*

I would recommend that the clasps should be made of stout sheet copper three inches wide, with four hinges, one at each angle of the bottom of the box and the others at the angles or edges of the thwart to which they belong; going over the thwart, and having an eye and a pin to fasten it. The pin should be secured by a small chain, six inches long. It will be necessary to have two clasps to each box, as described in figure 2, and the clasps should likewise be numbered to denote to which boxes they respectively belong.

Fig. 4, represents the end of the air-box, and the end or breadth of the thwart.

Fig. 5, represents the shape and make of the copper clasp, and its four hinges; one at each corner or angle. I place the pins for fastening the clasps in the after part of them, for this reason, that as the sailors sit with their faces towards the stern, they will thereby have a better opportunity of discovering whether any of the pins get loose.

The long air-boxes are to be lashed one over each side of the boat, just low enough to admit a free use of the oars, with their angular ends forward, and are meant to be used when a vessel is obliged to be quitted at sea, either by the accident of fire, or starting a but-end of a plank.

I remain, Sir,
Your very humble Servant,
GABRIEL BRAY.

*Charmouth, Dorset, February* 17, 1817.
To A. Aikin, Esq. Sec.

*Reference*

## Mr. G. Preston's portable Deck Glaſs, & Ventilator

Fig. 1.

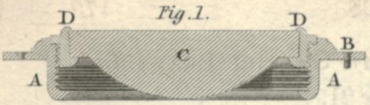


Fig. 3.

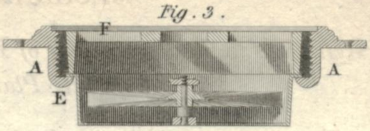


Fig. 2.

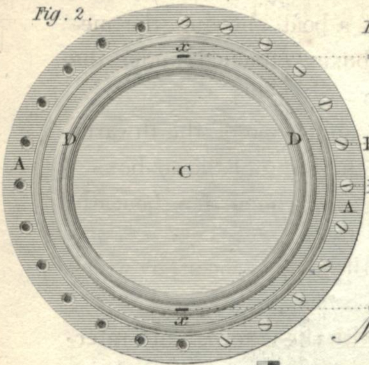


Fig. 5.

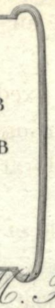
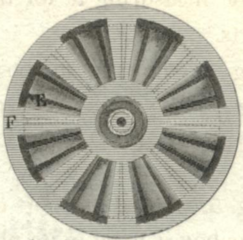


Fig. 4.



## Mr. Farnham's Steam Trap.

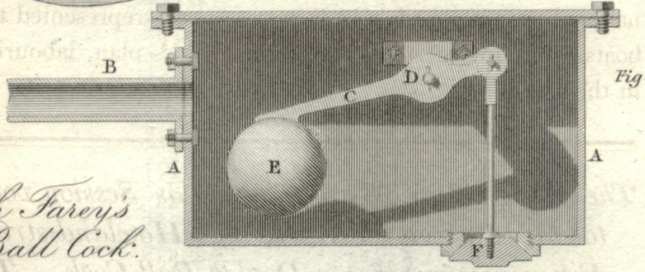


Fig. 6.

## Mr. Joseph Farey's Double Ball Cock.

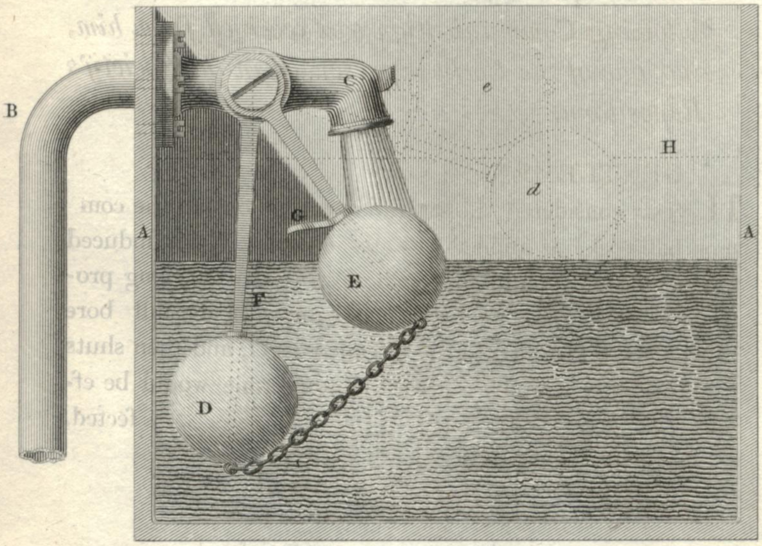


Fig. 7.

Drawn by J. Clement. Engraved by S. Porter.

### *Reference to the Engraving of Mr.* GABRIEL BRAY'S *Life Boat, Plate* 21.

FIG. 1. a transverse section of a boat, shewing the method of measuring it for the air-boxes attached under the thwarts.

Fig. 2, shews an air-box fixed under one of the thwarts.

Fig. 3, the method of securing the bung of the air-box.

Fig. 4, an end view of a thwart, with the air-box beneath it.

Fig. 5. an end view of one of the copper clasps, by which the air-box is fixed in its place.

The foreground shews a boat with the external and internal air-boxes attached. In the distance are represented two boats fitted up according to Captain Bray's plan, labouring in the surf.

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### *The* SILVER ISIS MEDAL *was this Session voted to Mr.* JOSEPH FAREY, *of Howland-street, Fitzroy square, for a Double Ball-Cock. The following Communication was received from him, and one of the Cocks is preserved in the Society's Repository.*

GENTLEMEN,

HAVING considered the several imperfections in the common ball-cock, as applied to water cisterns. I was induced to make some alterations which possess the following properties—first, that the cock will run with its full bore till the cistern is filled to the intended level, and then shuts itself instantly, thereby a great saving of time would be effected,

fected, if the cisterns were fitted with my improvement to the common ball-cocks, since it requires more time to fill the last foot in height of the cistern, than the improved one demands to fill it entirely; and in situations where the water is not clear, and requires time to settle before it is fit for use, it becomes of consequence to fill the cistern as quick as possible, for the water cannot begin to settle till the cock has done running, which is a tedious time in the common ball-cock. Another property of this improvement is, that the cistern may be filled to any required level, by only lengthening or shortening the chain which connects the two balls together, for as the cock remains open till the secondary ball has risen by its buoyancy, so as to bring the chain to a state of tension, and then closes suddenly, the length of the chain determines the height to which the cistern will fill itself. I applied this improvement to a common ball-cock, above twelve months since, and found it to answer the purpose extremely well, possessing all the above mentioned properties, though made quite in a temporary way; it did not cost more than a few pence, being made with one of the stretchers of an umbrella, and a large bung, which were connected to the cock by a small brass chain. I have not found it to require any attention, always acting very perfectly except during the frost, which every cock must be subject to. Thinking this improvement might be of some service to the public, I have taken the means of making it known through the medium of your useful Society; and am,

Gentlemen,
With the greatest respect,
Your humble Servant,
JOSEPH FAREY.

*No. 57, Howland Street, Fitzroy Square, January 15, 1817.*

To A. Aikin, Esq. Sec.

*Reference*

### *Reference to the Engraving of Mr.* FAREY'S *Double Ball-Cock, Plate* 22.

A A, is a section of a cistern lined with lead; B is a pipe which communicates with the reservoir; C the cock; D the ball and lever which is fixed to the plug E, the ball and lever which is put on a cylindrical part of the plug, and is at liberty to turn on its axis without turning the plug; the two balls are connected together by a small chain. When the ball D is placed in this position, which is a little on the left hand of the perpendicular or dotted line F, as the water rises in the cistern, it tends to keep the cock open: the ball E is kept a little on the right hand of the dotted line F by the stop or staple G, and has consequently a tendency to raise the ball as high as the chain will permit, without altering the position of the plug or cock; but, as the water rises higher, the ball E pulls the ball D to the right hand side of the perpendicular F, and then the water immediately raises the ball D to the top of the water, and shuts the cock. The two balls D E will then be in the position as represented by the dotted lines *d e*, and the water will be at the dotted line H.

## *The* SILVER ISIS MEDAL *or* FIVE GUINEAS, *was this Session voted to Mr.* W. FARNHAM, *of Feudal-street, Grange-Road, Bermondsey, for a Steam Trap. The following Communication was received from him on the subject, and a Model is preserved in the Society's Repository.*

SIR,

THE adoption of steam for the communication of heat having become general, I conceive that any contrivance to facilitate the construction of the necessary apparatus will now be considered useful.

A great and general inconvenience in steam apparatus is the accumulation of condensing steam in the lowest level of the steam-pipe; or, in other words, at the point of a vertical angle; the consequence of which is, that when this water is cold, as in the morning, on the arrival of fresh steam the sudden condensation thereof causes a violent concussion in the whole of the pipe, and makes considerable noise, and if there should be several such points, a considerable quantity of steam is condensed which might be applied to its intended purpose, and further, at the extremity of the pipe, if no preventive be adopted, the steam escapes as it is generated, and consequently a very great proportion of the heat is lost and misspent. The preventive generally adopted is a steam trap or syphon, which contains water into which the steam enters, and becomes condensed as it arrives, which syphon must be of such a height as to contain a column of water capable of overcoming the pressure of the steam. This height being such as to require much room, its application is occasionally very inconvenient and sometimes impossible.

To remedy every inconvenience from want of room, to save expence, and to prevent the escape of the steam till its heat is rendered serviceable, I have invented a trap which I beg to lay before the Society for the Encouragement of Arts. Any explanation that may be required, I shall with pleasure communicate whenever the Society may desire.

I am, Sir,
Your obedient humble Servant,
WILLIAM FARNHAM.

*No. 3, Feudal Street, Bermondsey, March* 20, 1817.
To A. Aikin, Esq. Sec.

## *Reference to the Engraving of Mr.* Farnham's *Steam-Trap, Plate* 22.

Fig. 6, A A, is a section of a square case or cistern, having a moveable cover on the upper part; B the steam-pipe; C a lever, moveable on a fulcrum at D, having the ball E at one end, and a conical valve F suspended at the other. As the steam is condensed, the water accumulates in the bottom of the cistern, which raises the ball, and at the same time presses down the valve, and lets the water run out; but, when the water is nearly all out, the ball descends and shuts the valve, and thus prevents the steam from making its escape.

*The* SILVER MEDAL *was this Session voted to Mr.* GRANT PRESTON, *of Burr-Street, Wapping, for a Portable Deck Glass, and Ventilator. The following Communications on the subject were received from him, and a Model of the Invention is preserved in the Society's Repository.*

SIR,

ENTERTAINING the highest opinion of the liberality of the *Society for the Encouragement of Arts, &c.* I have to request that you will lay this my communication respecting a portable *Deck Glass, with a Ventilator,* for the conveniency of giving air to ships' state-rooms, &c. before them. I am well aware, from the opportunity I have had of viewing different vessels in the habit of carrying passengers, of the necessity of having their small rooms made airy; and I have been induced to try my experiment, which, I am happy to add, has not been in vain. Indeed my deck glass, with a ventilator, has been much approved of by several of the East and West Indiamen which have them; also by the Leith smacks, &c. most of them being now furnished with those of my construction.

I am, Sir,
Your very humble Servant,
GRANT PRESTON.

*No. 38, Burr Street, April 16th,* 1817.

TO A. AIKIN, Esq. SEC.

CER-

## CERTIFICATES.

SIR,

YOU having made the first trial of your portable deck lights on board of the smack *Ocean*, then under the command of my late father, it therefore falls to my lot to repeat my opinion of their utility.

In the first place, I observe that they not only give as much light as the patent illuminator, but are more convenient in walking the vessel's deck, by not having the rise. But the chief utility in your's is, the conveniency of taking out in dry weather, with the apparatus for giving air, and putting them again in their place, the same as a fixture. I further observe, that after a variety of experiments having been tried at a considerable expence, your's is the most effectual I have ever seen for ventilating the state-rooms of the vessels in our trade, and have no doubt will be found very useful for ships going to warm countries.

Wishing you every success with them,

I am, Sir,

Your most obedient Servant,

ROBERT NESBIT.

*Leith and Berwick Wharf, London, 26th April,* 1817.

To Mr. GRANT PRESTON.

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SIR,

I CAN now assure you with much satisfaction, after so long a trial of your portable deck lights in the state rooms of the several smacks trading at this warf, that they are considered a very great improvement on the bulls' eyes formerly used, as we find they give us equal light, with the addition of ventilation, and admission of fresh air when the weather permits, the want of which was the greatest complaint made by passengers against our new constructed cabins.

I am, Sir,
Your obedient Servant,
ANDREW LAURIE.

*Leith and Berwick Wharf, 29th April,* 1817.

To Mr. GRANT PRESTON.

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SIR,

I HAVE the pleasure to inform you, that your shifting deck light with a ventilator, is a most convenient article for a ship's stateroom; I have now tried it three voyages between London and Dundee, on board of the smack *Union*, and it exceeds my expectation, both in giving air, and in its security from water coming down. I have no doubt that the invention will be found very useful to ships in general, particularly to those going abroad.

I am Sir,
Your obedient Servant,
JOHN WISHART.

*Smack Union, Down's Wharf, London, 28th April,* 1817.

To Mr. GRANT PRESTON.

Other testimonials in favour of Mr. Grant Preston's deck glass, &c. were received by the Society, but from the very satisfactory evidence contained in the foregoing certificates, it has not been deemed necessary to publish them.

### *Reference to the Engraving of Mr. G. Preston's portable deck glass and ventilator. Plate 22.*

Fig. 1, is a section, and fig. 2 a plan of the brass frame and the glass. Fig. 3 is a section, and fig. 4 a plan of the ventilator. The same letters of reference apply to the same parts in each figure. A, fig. 1, 2 and 3, is a brass frame which must be screwed down to the deck with the screws B B; C the glass set in a brass ring; D the ring having a screw cut on the external part, so that the glass may be screwed in or out of the frame at pleasure. E, fig. 3, is the ventilator resting on the bottom part of the frame, the glass being previously removed; F, a grate, set in the frame above the ventilator to prevent the people on deck from injuring the ventilator; F and E, fig. 4, are plans of the grate and of the ventilator. Fig. 5 is a flat bar of iron, the ends of which fit into the holes *x x*, fig. 2, for the purpose of unscrewing the glass C.

TEN GUINEAS *were this Session voted to Mr. C. WILSON, of Union-Street, Borough, for a Machine for Sweeping Chimnies. The following Communication was received from him on the subject, and one of the Machines is preserved in the Society's Repository.*

SIR,

I WILL thank you to lay before the Society for the Encouragement of Arts, Manufactures, and Commerce, a machine which I have recently invented for the purpose of sweeping chimnies. It has given compleat satisfaction in all the cases in which it has been applied, and I hope will supersede the necessity of employing climbing boys.

I remain, Sir,
Your obedient Servant,
C. WILSON.

*No. 25, Worcester-Street, Union-Street, Southwark,*
*December 4th,* 1816.

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CERTIFICATE.

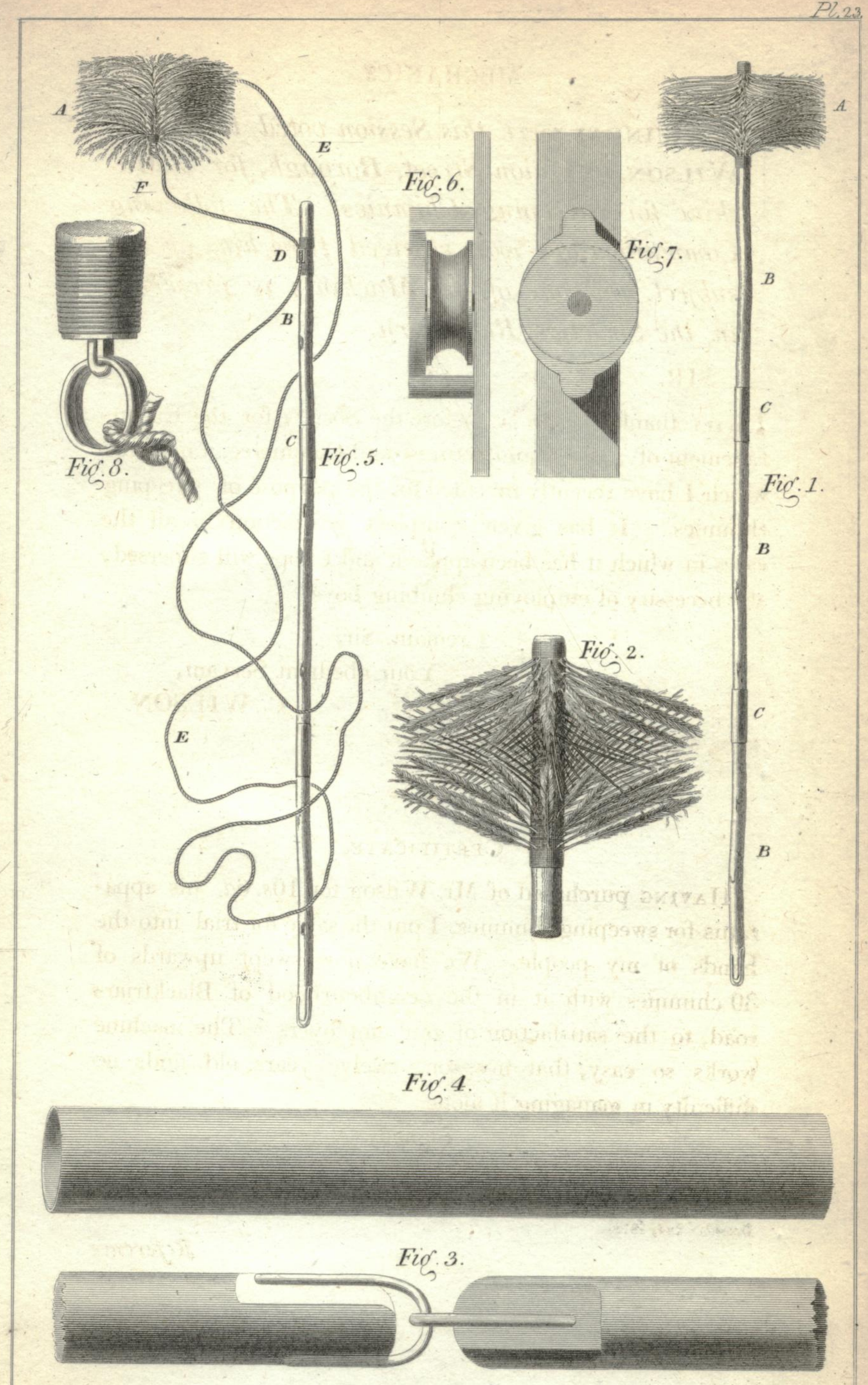
HAVING purchased of Mr. Wilson for 10*s.* 6*d.* his apparatus for sweeping chimnies, I put the same for trial into the hands of my people. We have now swept upwards of 30 chimnies with it in the neighbourhood of Blackfriars road, to the satisfaction of our employers. The machine works so easy, that my son, twelve years old, finds no difficulty in managing it alone.

Signed,
M. PALMER,
Chimney-sweeper, and dealer in soot.

*December 2nd,* 1816.

*Reference*

Pl. 23.



M.A. Nicholson Delin. A.W. Warren Sculp.

Mr. Wilson's Machine for Sweeping Chimneys.

## Mode of securing the Arab's rudder; Communicated by Captn. Bagnold, R.N.

Fig. 1.

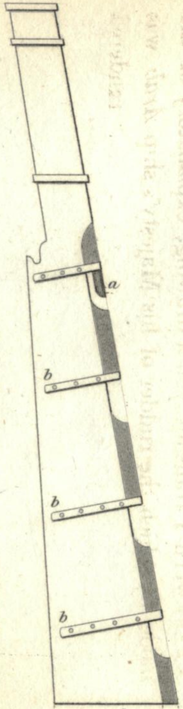


Fig 3.

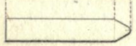


Fig. 2.

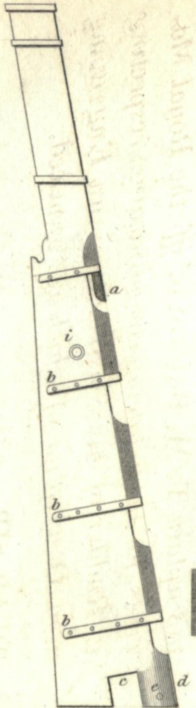


Fig. 4.

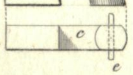


Fig. 5.

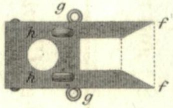
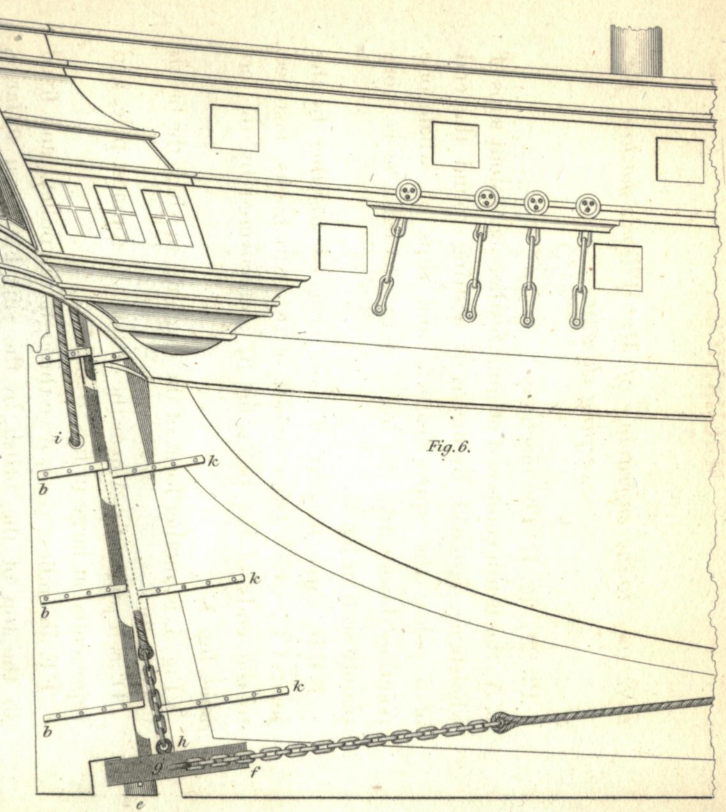


Fig. 6.



J. Clement delin.

J. Davis sculp.

### *Reference to the engraving of Mr. Wilson's machine for sweeping chimnies.*

Pl. 23, fig. 1. The machine.

A, the brush composed of quill feathers, and stout slips of whalebone, fastened by means of a string round the end of a pole; the upper feathers and slips of whalebone pointing downwards, the lower ones upwards; as is more plainly seen in fig. 2.

B B B, three lengths of pole fastened together by the joints CC, which latter consist of two wire hooks, fastened to the ends of the poles, fig. 3, and covered by the ferrule, fig. 4.

Fig. 5, is another form of the machine, in which the brush is moveable.

D, is a pulley fixed near the end of the topmost pole, and represented at large in figs. 6 and 7.

EE an endless cord, rove through the pulley, and fixed to the top of the brush, by the ring F (shown at large, fig. 8.) and to the bottom of the brush by a hook.

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## *The Thanks of the Society were this Session voted to Captain* T. M, Bagnold, *of the Royal Marines, for the following communication respecting a Rudder of his construction; an Engraving and Description of which are annexed.*

DEAR SIR,

Herewith I transmit you a drawing, explanatory of the mode by which the rudder of his Majesty's ship *Arab* was rendered serviceable after sustaining material injury in a tremendous gale off the banks of Newfoundland. Three of the pintles were completely gone, and the fourth was sprung three parts through—in five minutes more, the rudder must have been inevitably lost. The idea suggested itself to me, as modification of captain Pakenham's plan applicable to the repairs of an old rudder, instead of forming a new one; indeed having lost our carpenter and most of the useful hands by the yellow fever, I much doubt if we could have constructed it in eighteen days: it brought us into Lough Swilly, in the north of Ireland, blowing hard all the way; where having fitted it with new hawsers, we sailed for Portsmouth; and the officers of that establishment conceiving it perfectly secure, sent us without any alteration round to Woolwich, where the ship was paid off.

I am, Sir,
Your sincere friend and servant,
T. M. BAGNOLD,
CAPTAIN R. M.

*No. 7, High-Kay, Knight's bridge, January, 1817.*

To A. AIKIN, Esq. Sec.

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*Reference to the engraving of Captain Bagnold's temporary rudder. Plate 24.*

Fig. 1, the Arab's rudder in the state it appeared when taken on deck, all the pintles gone, except the upper one (*a*) which was sprung half through; *b b b* shows the braces of the broken pintles (of copper).

Fig. 2, the rudder, having a piece of about one foot square *c*, cut from its heel, leaving the main piece entire, the foot of which *d* was rounded to make an artificial pintle, and an augre hole was bored through it at right angles to the keel, to receive an iron bolt *e*, meant as a forelock to keep the rudder and artificial gudgeon together.

Fig. 4, is an end view of the rudder thus prepared.

Figs. 3, 4, plans of the bottom of the rudder in its original and altered state.

Fig. 5, the artificial gudgeon, made out of a spare cap, the dotted lines show the part cut out, forming a pair of jaws *ff* to embrace the stern post *gg*; and *h h* the vertical and horizontal eye bolts.

Fig. 6, a view of the ship's quarter, with the rudder fixed. The cap, or artificial gudgeon, is secured to the rounded end of the rudder by the bolt *e*, which serves as a forelock. To the horizontal eye bolt *g*, a chain and hawser was fitted on each side, the ends of which passing under the ship's bottom were brought in at the bridle ports, and set up forward from the vertical eye bolts *h*; another hawser on each side supported the weight of the whole; the ends were brought up the rudder case, and secured; to avoid confusion in the engraving, the course of them is shewn by a dotted line. A hole was made in the rudder at *i*, and a strong hawser passed through it as an additional security; the head of the rudder on deck was fitted with a collar formed by a couple of planks with a corresponding semicircular excision in each, as recommended by captain Packenham; *b b b b* the gudgeon braces.

*The* GOLD MEDAL *was this Session voted to* DAVID D. DAVIS, M. D. *of Charlotte-street, Bloomsbury, for a Craniotomy Forceps. The following Communication was received from him, and one of the Instruments is preserved in the Society's Repository.*

SIR,

YOU will oblige me by submitting the accompanying memoir and models of midwifery instruments to the inspection of the Society for the Encouragement of Arts, &c. The two larger models are varieties of an instrument constructed essentially upon the same principle, but adapted for different cases of difficulty. I propose to give them the common name of Craniotomy Forceps, and to distinguish them by the additional epithets of single, curved, and double curved. The smaller instrument is intended to bring away uterine or vaginal polypi, after their previous separation from their base, and may therefore be called uterine polypus forceps. I shall be happy to afford to the Society any explanation of the uses of the above instruments that may be deemed expedient.

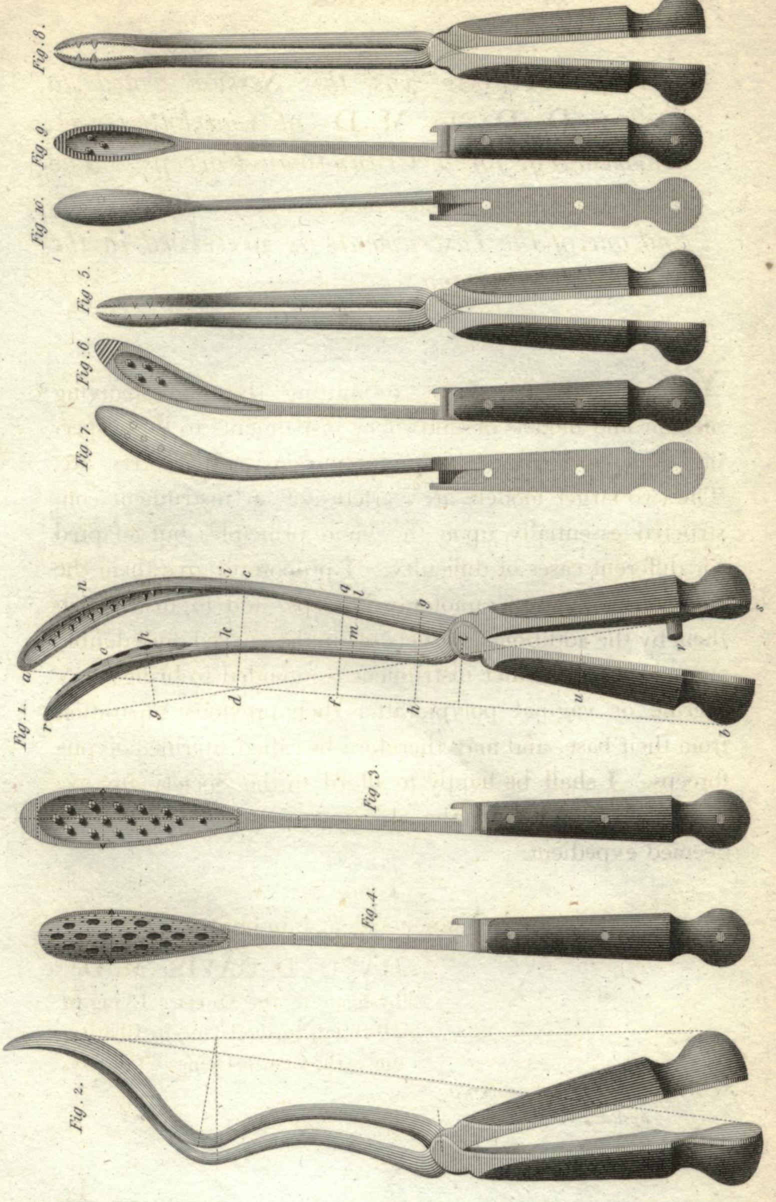
I am, Sir,
Your obedient humble Servant,
DAVID D. DAVIS, M. D.
Physician to the Queen's Lying-in Hospital, to the Lying-in Charity, and to the Central Lying-in Charity.

*No. 18, Charlotte-street, Bloomsbury,*
*April 22, 1817.*

To A. AIKIN, Esq. SEC.

IT

# Dr. Davis's Craniotomy & Polypus Forceps.



Drawn by J Clement

Engraved by J B Taylor

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It is a well known fact, that the head of the fœtus can sustain with more impunity a greater degree of pressure, for a short time, when dexterously applied by art, than a much less degree applied during a longer period, by the protracted and exhausting exertions of the natural powers. Hence the expediency in such cases of having recourse to the use of those instruments, the application of which enables us to supply the defects, and at the same time to promote the intention of nature, compatibly with the probable safety of both lives interested in the result. This peculiar department of the obstetric art is an exclusive acquirement of modern times. It commenced about a hundred and fifty years ago, with the invention of an instrument in which were combined the powers of compressing the fœtal head, and of applying traction to it at or in the neighbourhood of the part arrested. In what precise manner either of these effects was accomplished is not now positively known, as, indeed, it is not certain whether the first invented instrument, possessing these powers, was a *vectis* or a pair of forceps. The honour of the improvement is, however, claimed by this country, and, I believe, generally conceded to it in behalf of an obstetric family of the name of Chamberlen, consisting of a Doctor Chamberlen, the father, and his three sons, who practised midwifery in London with unrivalled reputation in the reign of King Charles the Second. Since that period, many important changes have taken place, and some substantial improvements have been made in this department of instrumental midwifery; so that the art may now perhaps be considered as being in ample possession of the resources and power likely to be suggested by a correct and practical knowledge of the anatomical principle here adverted,

verted to. There are, however, impediments to delivery, depending upon mal-conformation of the pelvis, which are beyond the reach of any expedients to be devised from such knowledge; and of these there are two classes or degrees. In some extreme cases of distortion, the cavity of the pelvis is so reduced in its dimensions as not to admit of the transmission of the child through it in any form, either living or dead. The other class holds an intermediate place between those of extreme distortion, which are proper objects of what has been called the Cæsarean operation, and those of limited confinement, admitting of relief compatibly with the lives of both mother and child. It is the intermediate class of laborious parturition that forms the proper subject of the present communication. In all cases included under this class, the space in the pelvis is presumed to be sufficient to admit of delivery compatibly with the more valuable life of the mother, that of the child, however, being necessarily sacrificed for the safety of its parent. This object is attained by an operation which, when applied to the whole or to an undefined part of the fœtal subject, is called embryotomy, and when exclusively to the head craniotomy*. This latter form of it is required to be performed when the fœtal head is too large to be expelled through the pelvis by the parturient efforts of the uterus; or when, in the absence of such efforts, delivery cannot be effected by any other means compatibly with the security of the mother's life. In its application to the dead fœtus, and perhaps in some other circumstances of extreme difficulty, this mode of delivery, contrary to the opinion of a late eminent professor,

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* See Hamilton's Outlines, Difficult Labours, chap. ii. s. 2.

† Hippocrat. Op. cura Fæcii, tom. i. p. 618. Philom. apud. Ætium, tom. iv. cap. 23.

fessor, was unquestionably known to the ancients †. But we are indebted to times comparatively modern, and chiefly perhaps to the obstetric practitioners of this country, for the developement of those rational and fixed principles, founded equally on an enlarged humanity and on accurate knowledge of the subject, which are now received as constituting its moral sanctions and professional obligations. The operation of craniotomy consists, as the term imports, in making an aperture into the cranium. Its object is to reduce the bulk of the fœtal head, by the opportunity which it affords for the escape or removal of a part, or of the whole of its contents. This aperture made sufficiently large, is in many cases all that is necessary to be effected, in order to ensure a speedy and a prosperous delivery; which, indeed, is then accomplished by the unassisted efforts of the uterus. In many others, however, we are obliged, in order to gain our object, to apply more or less force of extraction, either as a substitute for the exhausted action of the womb, or as an auxiliary to that power when it might be imprudent to entrust the result to its doubtful or protracted effects. It may, indeed, be asserted, that in all more difficult cases of labour of this class, the application of extracting force to finish the delivery, is an essential counterpart to the operation of craniotomy. For affording the assistance, in such cases presumed necessary, a great variety of instruments have been devised and recommended, which, however, are reducible into three kinds or classes, viz. hooks of divers shapes and powers; retractors, upon the principle of the tire tête of Mauriçeau, and parallel bladed forceps. The use of instruments, both of the first and last classes, is probably coeval with the practice of instrumental midwifery itself. Instruments of the hook class were distinctly recommended by Hippocrates*, by Celsus†, and by Ætius‡. Hippocrates states the necessity, in some instances, of making use of two instruments of this kind, the one to antagonize the other; thus clearly anticipating the double crotchets of modern times. Albucasis§, the last of the Arabian writers, gives figures of the obstetric instruments known and used in his time Ambrose Parè ||, the father of modern surgery, gives figures of instruments of the same kind. Gregoire Peu, Maynard, and almost all the authors who have written upon the subject during the last and preceding centuries, might be added to the list of improvers or approvers of instruments of this class. Notwithstanding, however, the high antiquity and almost universal adoption of embryulcia, and its instruments under various modifications, I have always felt the strongest objection to their use, as being unsafe, under certain circumstances, in the most cautious hands, and as being extremely dangerous in those of rash, aukward, or inexperienced practitioners. The blunt hook, which I believe is a modern invention, if used carefully and properly, may, indeed, be admitted as an exception to this remark; but its powers are very limited, especially in head presentations requiring the operation of craniotomy; not to add, that even this less dangerous form of embryulcia has been attended, in many instances, with deplorable consequences.

Under the second class of embryotomy extractors to which I have referred, we may enumerate at least four varieties; viz.

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* Hippocrat. loc citat,

† Cels. op, L. vii, cap. 29.

‡ Etii op. tom. iv, cap. 23.

§ Spacch. Gynæc. in Albucasi, cap. 57. p. 446.

|| Les Ouvres d'Ambroise Parè, edit. a Lyon, 1641, Fol. p, 608-9.

viz. the tire tête of Mauriceau *, the extracting wings appended by Barton to Ould's terebra occulta †, M. Donaira's simple contrivance of a little wooden cylinder and ribband, as given to the public by Baudelocque in his system of midwifery ‡, and a modification of the same contrivance in a more operose form in the lately introduced extractor of professor Assalini §. The common and characteristic principle of all these instruments is, that they are exclusively applied to the interior surface of the fœtal skull tranversely across the aperture through which they are directed to be introduced. To the part of the mechanism so applied there is to be attached at right angles a handle made of some accessible or convenient material, by which the operator is instructed to draw down in the direction of the axis of the pelvis. To this class of instruments there are also substantial objections, affecting equally their power and their safety, and affording unquestionably a very ample and sufficient apology for the attempt to supply the profession with better.

Our third class of embryotomy extractors includes amongst its specimens the principal instrument which I have the honour of submitting to the consideration of the Society, under the designation of craniotomy forceps. The use of instruments having the forceps form of purchase to complete the delivery in cases of laborious parturition is, however, no modern invention, much less a novelty of recent date. The class, indeed, is so numerous as to admit of a subdivision of it into two or three species or varieties. Under one of these

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* Traité des Maladies des Femmes grosses, tom. i. liv. 2, p. 367.

† Burton's Midwifery, p. 230, plate 16.

‡ Baudelocque's System of Midwifery, (Heath's Translation), Vol. iii. p. 167.

§ Transactions of Society of Arts, &c. for 1816.

subdivisions might be placed a species of compressing or crushing forceps. It appears probable that Hippocrates alludes to instruments of this kind when he advises the head to be seized Ιῶ ϖίεϛρω *. I am disposed also to believe, that the *misdachs* of Albucasis, and more especially the larger forceps, were intended at least in part to diminish the fœtal head by the effect of compression. I am aware of Smellie's opinion upon this subject †, but I cannot reconcile it to the barbarous appearance of the instruments themselves as exhibited in the figures given of them by Spacchius ‡. With regard to another instrument of the same author, the forfex dentatus, of which we have also an engraving in Spacchius, it is expressly told, that it was to be used for the purpose of breaking down or crushing the head of the fœtus §. This same power appears to have been possessed by the pieds de Griffons of Ambrose Parè ||, which was, however, more particularly intended by its inventor for the envelopement and extraction of the child's head when separated from its trunk, and left in utero. I need not add, that crushing forceps might be used with considerable advantage to accomplish the additional object of extraction.

Again, embryotomy forceps admit of another very important subdivision, founded upon the different modes in which the opposite parts or halves of the instrument are connected together, or adjusted for their common and ultimate object of extraction. The different claws of Ambrose Parè's pieds

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* Hippocrat. loc citat; see also his commentator. M. C. Rhemus Comment. vi. Spacch. Gynæc. p. 683.

† Smellie's Preface.

‡ Albucasis apud Spacchium, p. 446.

§ Idem, p. 447.

|| Ambroise Parè, p. 608, et sequent.

de Griffons are fastened together and impelled to act by an apparatus similar to that of the once celebrated specula matricis. The structure of Fried's forceps * partakes considerably of the same sort of contrivance. All other instruments of this class that I have ever seen or heard of are connected together by some sort of joint, situated in or about the centre of the instrument, and common to each half of it. But this connection may be effected either by a pivot joint, which is only moveable on its own axis, or by some other mode of junction admitting of the separation at pleasure of the two blades. Here are also to be classed all the forceps of this tribe best known in modern times; viz. those of Puisseau, Schurer †, Lyon, and lithotomy forceps of La Motte ‡. Of these the power is nearly equal, all of them (with the exception of La Motte's) being armed with long transfixing teeth. That of Dr. Lyon (formerly of Edinburgh) is best known in this country. To the instrument-makers here, however, Lyon's forceps with some little alteration are better known under the designation of Haighton's tooth forceps; because, I apprehend, Dr. Haighton is in the habit of recommending them in his estimable lectures upon midwifery. In common with those of Puisseau and Schurer, they are really a very useful and convenient instrument, and like them well adapted for the extraction of the dead fœtus, in cases of moderate confinement or distortion of the pelvis. It happens however unfortunately, that a great majority of difficulties of this kind depend upon want of sufficient space at the superior aperture of the pelvis where the application of

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* Voight. de Capit. Infant. Abrupt. XL. p. 469. Haller Disput. Chirurg.

† Disput. Chirurg. Loc. Citat.

‡ La Motte Obs. p. 247, 250, 403, 404.

rivet-jointed forceps might be attended with much difficulty and inconvenience, and where generally, indeed in all cases of great confinement, the purchase would necessarily be too limited to admit of a sufficiently powerful exertion of extracting force. This remark I am very certain is perfectly intelligible to such of my readers as are practically acquainted with the difficulties to which it refers. For want of power to introduce the blades singly so as to enable the operator to command an ample purchase above the confinement or distortion occasioning the arrest, it still became necessary, in the more difficult cases of embryotomy, to have recourse to the greater but more dangerous power of blunt hooks and crotchets. But the power of introducing the blades singly has been accessible to us for more than a century, perhaps like some objects of sensation too near the organ to excite a distinct impression, it having been presented to us in a great variety of forms in those instruments which are most familiar to us, viz. the modern obstetrie forceps for extracting the living child. At length, however, it was obscurely seen, and rather imperfectly and clumsily applied in an instrument which has been for some years in the possession of my friend Mr. Clarke, and a model of which I had the honour of exhibiting before the Committee of Mechanics during the last Session of the Society. I regret that I am not able to trace the history of this instrument, it having been the first specimen of obstetric forceps with parallel blades and a moveable joint. It is probable, that the capital objections to it which I pointed out to the Committee of Mechanics had the effect of preventing its admission into obstetric practice. Since that time, I have heard of another instrument which I ought not to omit noticing in this place, inasmuch as it belongs to the class of forceps with parallel blades and a moveable joint. I have ascertained the date of this to be certainly posterior to that in Mr. Clarke's collection. It has been called by Mr. Rawlins * (of Oxford) its inventor, perhaps not very correctly, the reflected forceps. To the reflected forceps I know of but one objection, but that is fatal to them; they want power. In concluding this sketch of the various contrivances to which our art has hitherto had recourse for the relief of laborious births belonging to the class here contemplated, I may be permitted to offer the instrument immediately to be described to the acceptance of my brethren, as one in which the requisite properties of ample power, perfect safety, and great facility of application are more effectually combined than in any other form of craniotomy extractor that I am acquainted with.

D. D. DAVIS, M.D.

## CERTIFICATE.

THESE are to certify, that we have seen and examined Dr. DAVIS's craniotomy forceps, and we think that the instrument is perfectly well calculated for the purpose of extracting the child in those unfortunate cases where craniotomy is necessary. It is simple in its construction, easy of application, effective in its power, and much safer for the patient than the crotchet, or any instrument now in use.

J. SIMS, M. D.
RICHARD CROFT,
CHARLES M. CLARKE.

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* See Rawlins's Dissertation on the Obstetric Forceps.

## *Reference to the Engraving of* Dr. Davis's *Craniotomy Forceps, Plate* 25.

In figure 1, is given a very correct representation of the general form and structure of the single curved craniotomy forceps. The relative dimensions of the different parts of the instrument may be easily found by reference to the scale.

*a b*, is a straight line drawn between the extreme points, at the ends respectively of the external blade and its handle, and subtending the curve of the instrument. This line measures thirteen inches, and gives the greatest length of the forceps.

*c d*, a line drawn at right angles at *d*, from the subtending line *a b* to the outside of the external blade, measuring $1\frac{7}{8}$ inch, showing the extreme curve of the instrument at this part where the shank begins to expand into grasping surface. N. B. The line *c d*, as represented in the Engraving, measures two inches; but this deception arises from the instrument being seen a little in perspective for the convenience of showing its grasping surfaces.

*e f*, a line drawn at right angles at *f*, from the subtending line *a b* to the shank of the external blade at *e*, the thickness of the shank inclusive, is $1\frac{3}{4}$ inch, and is a measure auxiliary to that indicated by the line *c d* of the curve of the instrument subtending respectively the right angles at *d* and *f*.

*g h*, a line drawn at right angles at *f*, from the line *a b* to the shank of the external blade at *g*, the thickness of the shank inclusive, *g* being $\frac{7}{8}$ inch distant from the centre of the joint at *t*, measures $1\frac{1}{2}$ inch, and serves to give the direction of the shank between the points *c* and *g*, relatively to the curvature of the grasping blade.

*i* and *k*, measuring each about $\frac{3}{8}$ inch, are intended to exhibit the strength of the shanks at or near their expansion into blades.

*l m*, measuring each something more than *i k* respectively, are intended to exhibit the perpendicular strength of the shanks at the distance of two inches from the centre of the joint.

*n*, is intended to direct the reader's attention to the grasping part of the external blade. This part of the external blade is hollowed out like a spoon, from the bottom of which project perpendicularly upwards seventeen sharp and angular teeth. The points of these teeth, however, are under the level of the brim, by which the operator is enabled to introduce and withdraw this blade at pleasure, without the risk of injuring the mother.

*o*, the perforations in the convex surface of the grasping part of the internal blade are here wished to be represented. These perforations are also seventeen in number, and are arranged in such a manner as to receive very accurately the corresponding teeth of the opposite blade. The convexity of the internal blade, which is effected without prejudice to the weight of the instrument by the apposition of hollow plates, corresponds with great precision to the concavity of its opposite external blade. Hence, it is evident, that the convex surfaceof the internal blade upon the instrument being adjusted at the lock, must have the effect of pressing any intermediate substance upon the teeth of the external blade. But the external blade is to be applied to the outside of the child's head, a substance which is not a little compressible and penetrable, while the internal blade is to be introduced

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into the cavity of the skull, the operation of craniotomy having been previously performed. The bones of the fœtal skull being at this period thin and pliable, the convex surface of the internal blade will have the effect of pressing the scalp into the cavity, and upon the teeth of the external blade. Thus armed with seventeen transfixing points which are forced to penetrate into the scalp and cranium of the fœtal head, it is manifest, that the craniotomy forceps cannot readily slip.

*p q* a line drawn at right angles, at *q*, from the line *r s* to shew the greatest degree of curve of the internal blade. This line measures $1\frac{1}{12}$ inch.

*r s* a straight line drawn between the extreme points of the internal blade and its handle. This line measures $12\frac{3}{4}$ inches.

*t* the loose joint borrowed from the common obstetric forceps.

*v* a brass nut projecting at right angles from the metallic surface of the handle of the internal blade, intended to be received into a corresponding perforation in the opposite handle. For this contrivance, I am indebted to Mr. Batschan, * the maker of the instrument. Its object is to admit of greater play at the joint, and, at the same time, to insure an accurate adjustment of the grasping surface.

From the above description of the single curved craniotomy forceps, the mode of using the instrument will be readily anticipated. Each blade is to be introduced singly. The concave external blade is to be conducted along the palm of the practitioner's left hand, and along the fingers, and applied to that part of the external surface of the fœtal head, which may happen to be nearest, or in opposition to the sacrum of the mother. It should be carried sufficiently far to insure an ample purchase, and also beyond the point of confinement or distortion, where the obstacle is presumed to be greatest. After the escape or removal of a sufficient quantity of brain, this part of the operation will be found, in most cases, extremely easy. The next step is to introduce the internal blade through the aperture previously made in the presenting part of the fœtal cranium into the cavity of the skull. The grasping surface of the instrument is then to be brought firmly together by a cautious adjustment of the lock. The accuracy of such adjustment having been ascertained, by a careful examination of the locking part of the internal blade in relation to the orifice in the fœtal skull, through which it has been introduced, and of that part of the surface of the head to which the grasping surface of the external blade has been directed to be applied, the operator is prepared to commence the application of extracting force. Whilst drawing down, in the direction of the axis of that part of the pelvis immediately below the presenting part of the head, the practitioner should keep the handles of the instrument firmly together, to prevent its slipping. The force of traction to be applied must be estimated by the difficulty to be overcome; the degree in the first instance to be moderate, and to be gradually increased according to the exigency of the particular case. It should be applied also preferably during a pain, or, in the absence of pains, at intervals corresponding in duration to those usually observed by nature at an advanced period of labour. The pull should be most steady, and with some little variation in its direction. In a great majority of laborious births, requiring the operation of craniotomy, the delivery will thus be speedily and safely effected. I need not observe that the power of the instrument though infinitely safer in its application than any other, should not be abused by a rude and undexterous exertion of it. It should be remembered that it is possible to tear or otherwise injure the unfortunate subjects of operative midwifery, even without having recourse to any instrument whatever.

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* Mr. Batschan resides at No: 35, Worship-Street, Finsbury-Square. He works for most of the surgeons' instrument-makers in London, of any of whom, therefore, the instrument may be purchased ;

Fig. 2, the craniotomy forceps of the second form, or the double-curved craniotomy forceps.

In cases of great confinement of the pelvis, it will sometimes happen that the frontal and parietal bones may be removed in fragments of greater or less magnitude, without, however, bringing down the remainder of the head, so as to make it engage in the brim of the pelvis, the occipital part of it remaining unmoved, and hitching over the pubis. By the removal of the anterior part of the skull and scalp, all purchase accessible to the single curved forceps is lost, inasmuch as that instrument could not be reversed in the application of its curve without causing with its shanks much and dangerous pressure upon the perinæum. For the relief of such melancholy cases, this other form of the instrument has been devised. The whole of the anterior part of the fœtal skull being presumed to have been removed by the repeated purchases of the single curved forceps, the external blade (*i. e.* the blade, as in the other case, with the teeth in its concavity) is to be introduced immediately behind the pubis, over the occipital part of the fœtal head with its polished convex surface to the pubis. The internal or grasping surface of that blade will consequently be applied to the outside of the child's head. The external or antagonizing part of the instrument must be introduced, so that the convex or grasping surface shall embrace the corresponding part of the child's skull on the inside. In consequence of the double curve here adopted, the purchase sought for will be easily obtained without the necessity of laying any material stress upon the perinæum, or os coccygis· the shanks of both blades of the instrument being diverted at the curve, from the axis of the brim of the pelvis to that of the lower part of the vagina.

THE line *a b* gives the united length of the external blade and handle of the double-curved forceps, and measures thirteen inches.

*c d.* This line gives in like manner the united length of the internal blade, and handle, and measures about 12 ⅜ inches.

*e f.* This line represents the distance of the shank of the internal blade at the centre of the curve at *f*, from the line *c d* subtending that curve, and measures two inches.

A line drawn from *g*, the centre of the curve of the shank of the external blade, the thickness of the shank inclusive, so as to fall perpendicularly on the line *a b*, gives the degree of curve best adapted for the shank of that blade, and measures 1½ inch.

*h* represents the joint similar as in the other case to that of the common obstetric forceps.

Figs. 3 and 4, exhibit the grasping surfaces, as well as the opposite antagonising surfaces of the shank and handle of either half of the instrument represented in fig. 1. The central teeth in fig. 3 are quadrangular, sharply pointed, and about a quarter of an inch long. Those near the brim of the concavity are necessarily shorter; they are all under the level of the sides bounding the concavity. In fig. 4, the perforations on the convex surface of the internal blade are represented as oval, being considerably longer in the direction of the length of the instrument, than in that of its breadth. The intention of this form being given to them is to insure a more ready penetration of the teeth of the external blade into the part of the fœtal skull immediately opposite to them, and thus to facilitate the adjustment of the instruments. The dimensions of the different parts of these surfaces may, without further description, very readily be made out by reference to the scale.

Fig. 5, represents a pair of small forceps, a little curved, to correspond with the curve of the sacrum, having for their object the removal of polypi or other tumours, occupying the passages or cavities contained in or above the pelvis; their separation from the vaginal or uterine surface having been previously effected. Each blade is supplied with three or four sharply pointed teeth, so situated, however, as not to meet upon bringing the handles together. These blades are to be introduced singly, the one on one side of the tumour and the other on the other. The practitioner, after adjusting the instrument at the lock so as to embrace the tumour firmly between the grasping surfaces of his blades, must apply a gentle extracting force in the direction of the axis of the passage, and he will thus be able, in a very short time, to remove the annoyance without the smallest difficulty to himself, or pain to his patient.

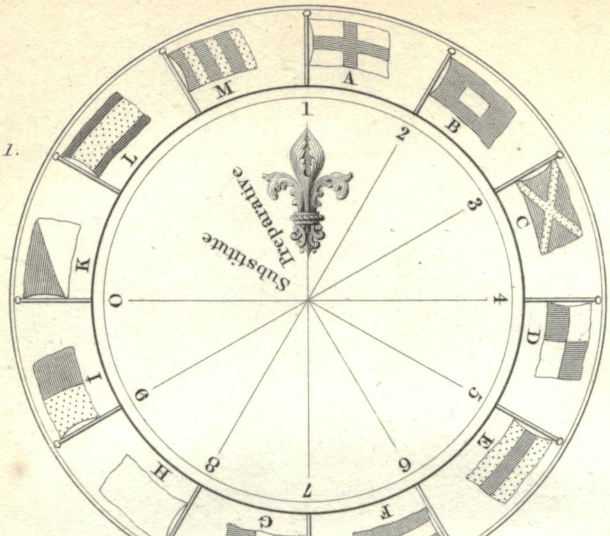
Figs. 6 and 7, are intended to represent the curve, and to exhibit the opposing surfaces of the instrument, fig. 5.

Fig. 8, represents a similar instrument without a curve. There are some varieties of tumours which occasionally infest the uterine and vaginal passages, that do not require the

# Mr. Conolly's Telegraph.

Pl. 26,

Fig. 1.



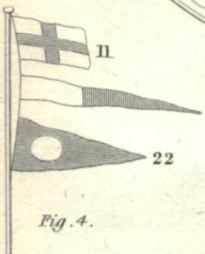


Fig. 4.

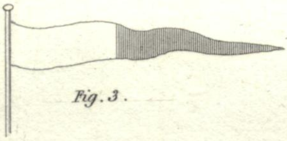


Fig. 3.

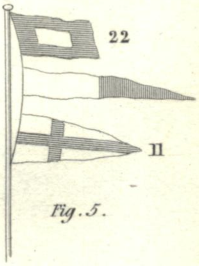
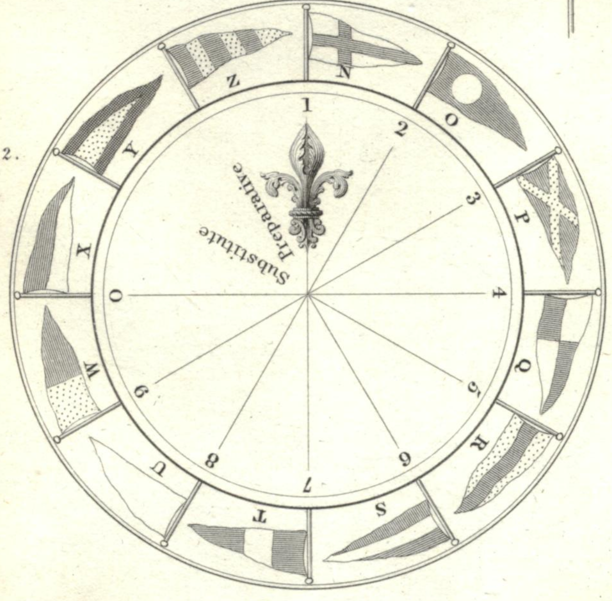


Fig. 5.

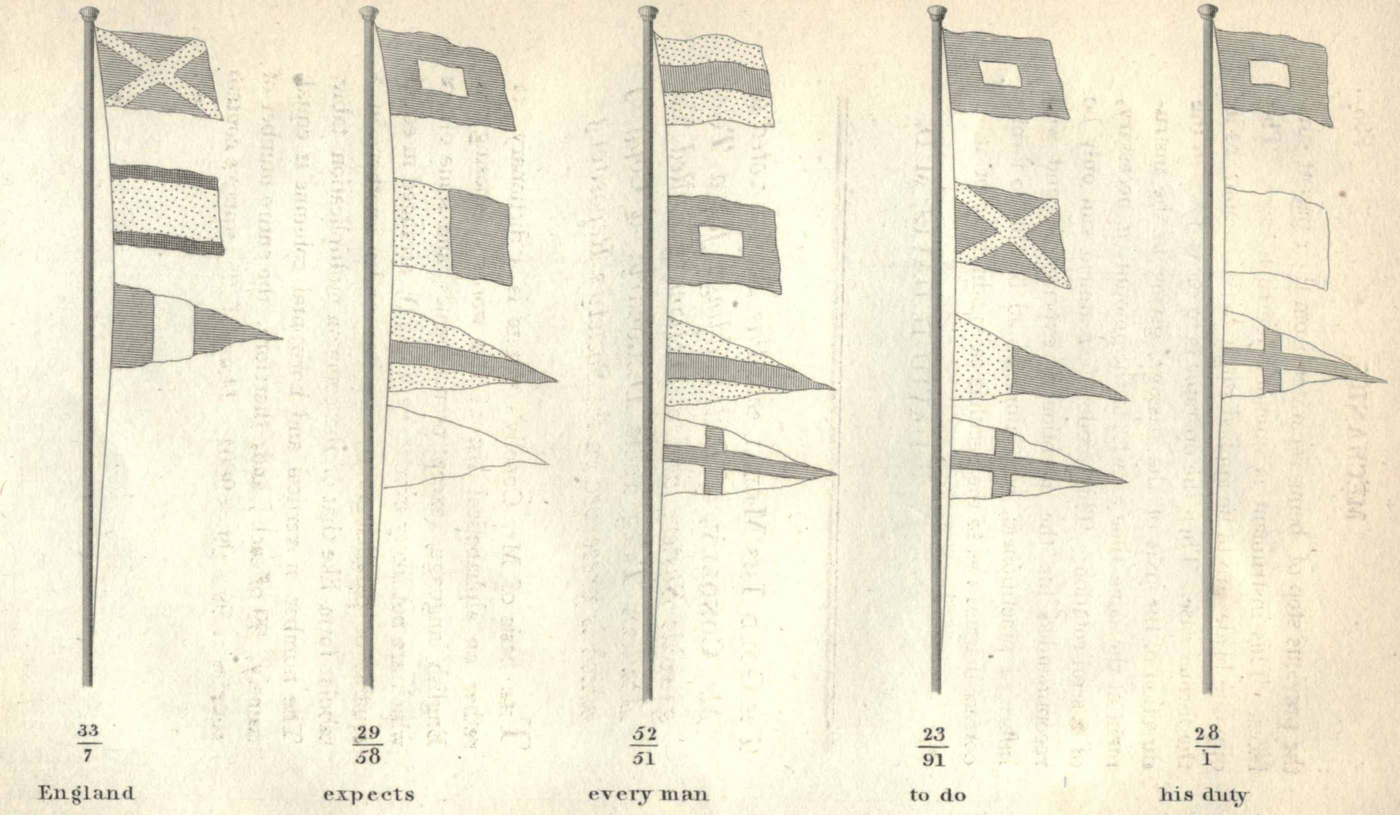
Fig. 2.



Drawn by W. Newton.

Engraved by S. Porter.

# Mr. Conolly's Telegraph.



Drawn by W. Newton.

Engraved by S. Porter.

the previous step of being separated from their parent surfaces. This instrument is intended for such cases. The opposite blades are to be applied singly to the tumour, as in the former case. Then the operator is to draw down in the direction of the axis of the passage, giving to the instrument at the same time a twist to the amount, if necessary, of a semi-rotation. This mode of treatment can only be recommended for the adoption of experienced and well informed practitioners, who alone would be able to form a correct diagnosis as to the peculiar cases admitting of it.

DAVID D. DAVIS, M. D.

## *The* GOLD ISIS MEDAL *was this Session voted to Mr.* CONOLLY, *of Rolls-buildings, for a Telegraphic System, and a Dictionary, called the Acadian Telegraphic Dictionary, a Copy of which is preserved in the Society's Repository.*

THE basis of Mr. Conolly's system is a dictionary, or rather an alphabetical list of the words composing the English language, (except proper names, and some others which are not likely ever to be wanted), arranged in equal squares or parallelograms, one line under another, in a tabular form like that of the common multiplication table. The number of vertical and horizontal columns is equal, namely, 99 of each; and, therefore, the entire number of squares is 99 × 99 = 9801. Many of the squares contain only one word; but in others, where no ambiguity can arise from the practice, the radical word and several of its modifications also are arranged in the same square.

The squares being thus filled up, and the vertical and horizontal columns being numbered consecutively from 1 to 99, the vocabulary is compleated.

In this arrangement, it is obvious that any word may be expressed by stating the number of the horizontal and of the vertical column, in the intersection of which the word in question is placed. Thus, the word *boat* being arranged at the intersection of the 11th vertical and the 32d. horizontal column, may be expressed by the two numbers 11 and 32, provided a method has been adopted of distinguishing clearly the vertical from the horizontal numbers.

Flags are the only signals that can be made use of at sea; and by means of 24 of these and one pendant, Mr. CONOLLY is capable of communicating, with expedition and distinctness, all the words contained in his vocabulary. The flags are divided into two sets, of twelve each, the form of one of which is square, and that of the other is triangular. By means of four colours, white, yellow, blue and red, variously combined and in various patterns, he distinguishes easily each of the square flags from the rest; and, as for every square flag there is a corresponding triangular one, the same arrangement distinguishes the triangular flags from each other.

Ten of the square flags denote the numerals and cypher expressive of the vertical column of numbers in the vocabulary, and the corresponding triangular flags denote the same numbers in the horizontal column. Of the two remaining square flags, one is the preparative signal, and the other, called the substitute, shews that the square flag, which is displayed along with it, is to be taken twice: thus, when the flag, No. 1, is displayed above the substitute, it indicates 11, as the flag, No. 2, in the same circumstances, means 22. The corresponding triangular flag is likewise a substitute for the numbers of the vertical column; and the remaining, or twelfth triangular flag, is used for a purpose which will presently be mentioned. Fig. 1, plate 26, shews the square flags, and fig. 2, the triangular ones.

The pendant, fig. 3, is used only for expedition in those cases where two substitute flags would be required: it is displayed between the square and triangular flags, and indicates that each of them is to be taken twice; thus, fig. 4 has the square flag, No. 1, and the triangular one, No. 2, with the pendant between; which implies that the upper or horizontal square intended is No. 11, and that the vertical square intended is No. 22; fig. 5 shows a similar arrangement, implying No. 22 in the horizontal, and No. 11 in the vertical column.

Hence it is obvious, that no word will require more than one display of flags, and that the number of flags in each display can never exceed four. As an example of Mr. Conolly's method, plate 27 exhibits all the signals required for transmitting Lord Nelson's celebrated signal. The first display is of three flags; the upper square one is No. 3, the lower square one is the substitute, giving together 33 for the number of the vertical column; the triangular flag is No. 7, therefore, the word intended is to be found at the intersection of the 33d vertical, and the 7th horizontal columns in the alphabetical vocabulary. In the same manner the four other displays, compleating the signal, are to be interpreted.

It, however, may happen, not unfrequently, that proper names of men, of ships, &c. are to be transmitted; and, as it is impossible to include these in the vocabulary, recourse must be had to spelling. The signal indicative of this is the 12th triangular flag, which must be hoisted accordingly; after which the whole 24 flags are to be considered as representing the letters of the alphabet. See figs. 1, 2, plate 26.

Mr. CONOLLY's system admits also of almost an unlimited variety of private signals. Suppose the interior circle of figs. 1 and 2, plate 26, to be moveable about its centre, it is then obvious, that by turning it more or less, the series of numbers may be made to begin with any particular flag; nor is it necessary (although for general use very convenient) that corresponding flags in the square and the triangular series, should indicate corresponding numbers in the vertical and horizontal columns.

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